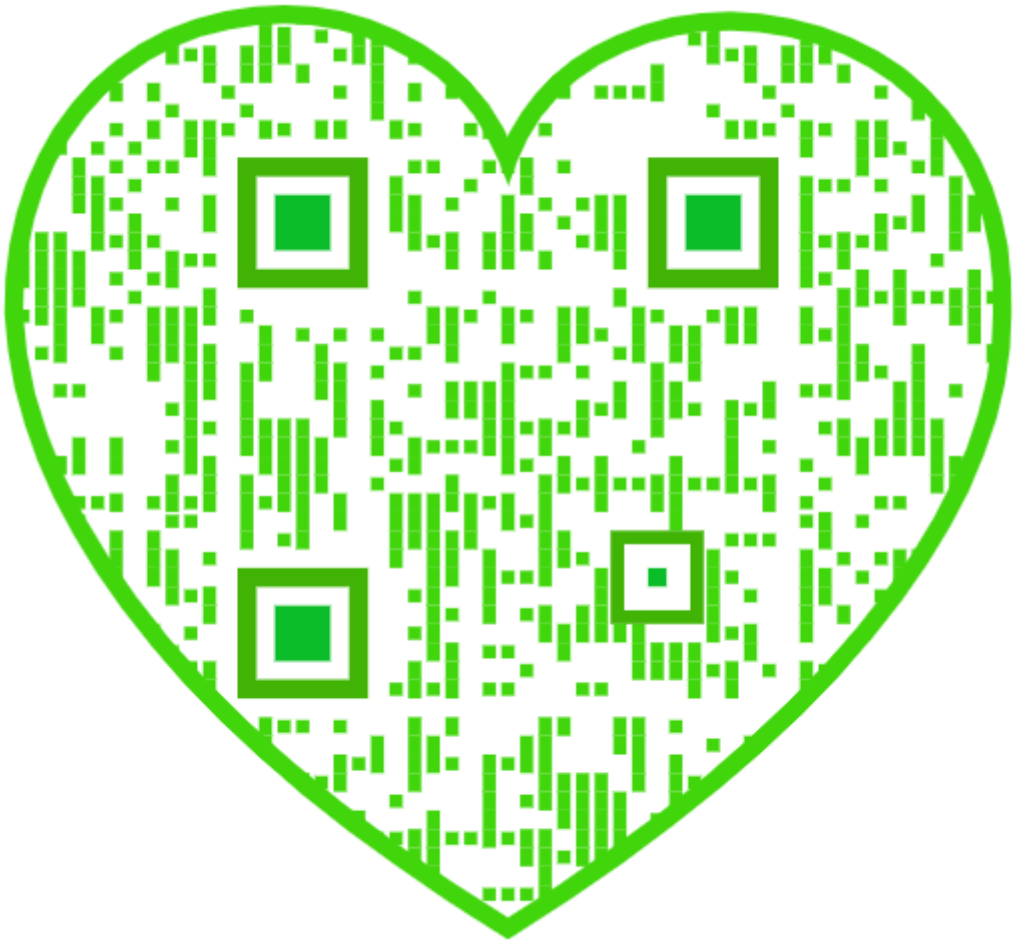
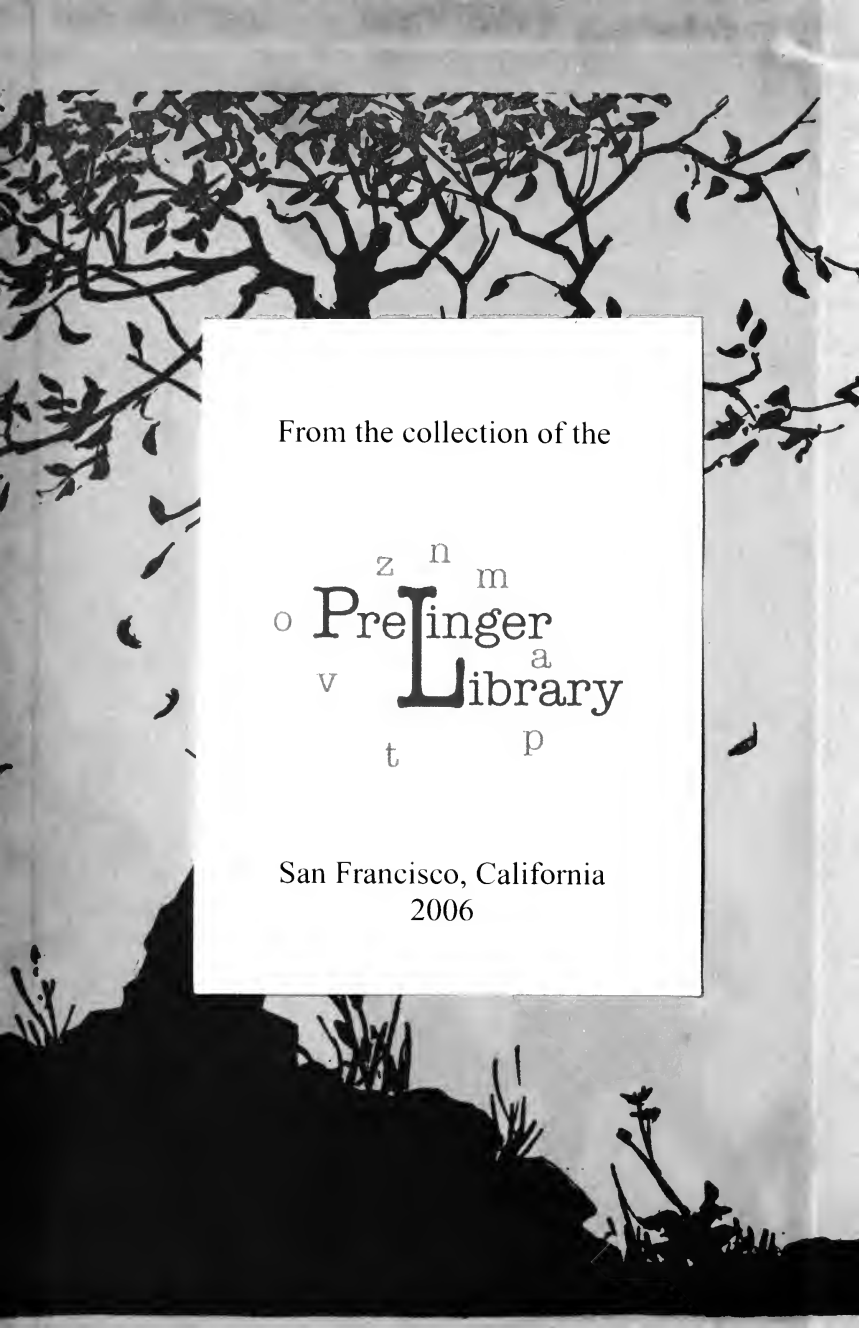
ADVENTURES IN LIVING

KEEPING FIT

WOOD - PHELAN - LERRIGO
LAMKIN - RICE

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KEEPING FIT

ADVENTURES IN LIVING

NOW WE ARE GROWING

MANY WAYS OF LIVING

KEEPING FIT

BLAZING THE TRAIL

HOW WE LIVE

ADVENTURES IN LIVING

KEEPING FIT

By

THOMAS D. WOOD, M.D.
Professor Emeritus of Health Education, Teachers College, Columbia University; Chairman, Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association

ANETTE M. PHELAN, PH.D.
Staff Associate in Education, National Society for Prevention of Blindness

MARION O. LERRIGO, PH.D.
Formerly Staff Associate, American Child Health Association

NINA B. LAMKIN, A.M.
Formerly Supervisor of Health Education, Bellevue-Yorkville Health Demonstration, New York City

THURMAN B. RICE, M.D.
Professor of Bacteriology and Public Health, Indiana University School of Medicine

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E. M. FRERET

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TO THE TEACHER

"Health education can be promoted only by emphasizing all aspects of health; physical, mental, social, moral."

—*Health Education,* 1930.

Long experience in varied aspects of health education has brought home to the authors of *Adventures in Living* the importance of certain principles of philosophy and education, which they have attempted to apply in this series. The authors have taught or supervised health education, and the material in this series is offered as the result of their experience, actual classroom work and extensive, careful research. In addition, four of the authors are members of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association, two of these members having directed and supervised the construction of *Health Education,* an official report of that committee. This report has been accepted as a source of authoritative guidance in health education. *Adventures in Living* conforms to the spirit of the committee's findings and recommendations.

The books, *Adventures in Living,* have been prepared to embody the following distinctive principles and aims:

To teach health as a means to accomplishment and not as an end in itself.

To emphasize happy, healthful living, rather than the details of techniques.

To promote the growth of the whole child by activities which give him real experiences in healthful living.

To create in the mind of the child an attitude of respect for the body and its processes, and to teach about the body as a whole, rather than as a collection of anatomical systems.

To provide for healthful experiences without making the child introspectively health-conscious.

To suggest individual and cooperative projects of social value, utilizing school, home and community experiences.

To integrate health education with other school subjects and activities.

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Chapter I

THE GERMAN CHIEFTAIN AND THE ROMAN BATH

The Roman people of 2000 years ago enjoyed bathing. They were proud of their great public baths, which were very beautiful marble buildings. Great stone aqueducts brought the water down from the hills. The aqueducts were so well built that four of them still supply water to the city of Rome. The Romans went to their baths for pleasure, much as the people of today go to the picture shows. When the Roman governors went to the western colonies they had baths built. Some of these baths may be seen today; some of them at Bath, England, at Trier, and at Cologne, in Germany, and at Salzburg, in Austria.

The people of western Europe at that time were barbarians. They lived in tribes and were hunters. They dressed in the skins of animals, fought with spears, and did not always bother to cook their meat before eating it. They did not take the trouble to bathe. A young Roman, writing back

THE CHIEFTAIN WAS CURIOUS ABOUT THE ROMAN BATH.

home, told of the bad odor from the unwashed bodies of the barbarians.

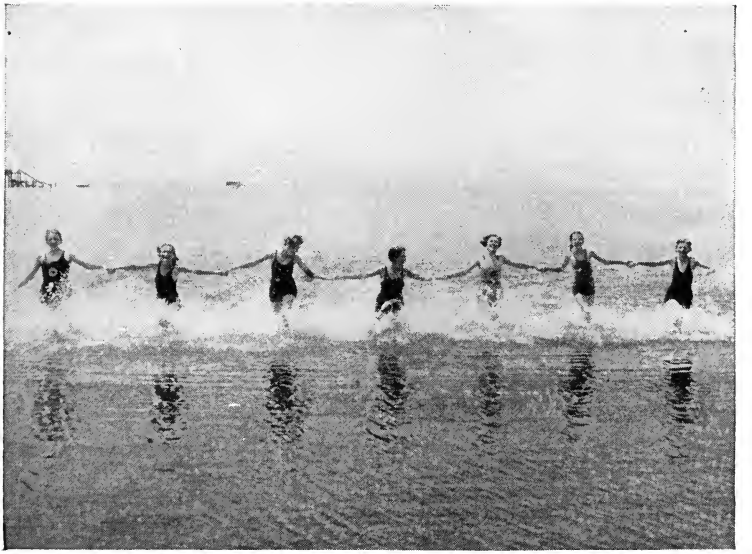
The Roman colonies reached as far north as the Rhine River. Beyond that, the German tribes were their own masters. The story goes that once a chieftain from beyond the Rhine swooped down unexpectedly and captured a Roman city, where the governor had just built a beautiful bath.

The chieftain tried to show a great scorn for the things that the Romans had done, and for the comforts that they had. Nevertheless, he was very curious about them all, and finally decided to try the Roman bath.

Can you not see him stepping cautiously into the perfumed water? How surprised he was when he found out how good it felt. As the old chieftain went through the warm bath, into the cool one, and then into the very cold one, he grew more and more pleased. He became so fond of the bath that he spent most of his time in it. He even held his important councils in the bath. So he formed the habit which the Romans had enjoyed—the habit of bathing.

Today in most of the civilized world, bathing has become as common a custom as the habit of using clean dishes. One has only to go through a warm

scrub, and to finish off with a cold shower and a brisk rubdown to find out why. Such a bath always makes one feel that he can go out and conquer the world.



Courtesy National Board, Y. W. C. A.

A PLEASANT WAY TO BATHE.

The bath gives pleasure not only to the one taking it; but it also safeguards the pleasure of those with whom one has to live and work. The letter which the young Roman wrote home so long ago pointed out that it was not pleasant to live with

people who do not take baths. The reason for this is that perspiration carries out waste materials, and deposits them on the skin. Unless these waste materials are removed, they produce unpleasant odors. To keep the skin free from odors, undergarments must be changed after a bath, because the waste which the body has given off clings to them.

Oil gathers on the surface of the skin. It comes from little glands in the skin, and helps to keep the skin soft. When there is not enough oil, the skin becomes dry, or chapped, and then a little lotion or cold cream rubbed into the skin relieves the discomfort. The oil is useful, but it helps dirt to cling to the skin. The oil in your skin is one reason why you need warm water and soap for a cleansing bath. Rub a little oil or grease on your hands, and then try washing them in cold water without soap. Then try soap with warm water. Which method removes the oil more easily, the cold water or the warm with soap?

There is no reason why anyone should go without a bath, just because he does not have a well equipped bathroom. There were few bathtubs in the United States until after 1840. Many men who made history for our country in those early days

had nothing more than the barest necessities for a bath. Those were a basin of warm water, a piece

MANY PEOPLE STILL KEEP CLEAN THE OLD-FASHIONED WAY.

of soap, a washcloth, a pitcher of cold water for a cold sponge, and a coarse towel for a rubdown.

Frequent bathing makes us more acceptable to our friends and neighbors and adds to our own self respect. There are, however, other values in bathing that are just as important as these. A daily cool bath (a sponge, a plunge, or a shower) followed by a brisk rubdown with a coarse towel leaves the skin glowing and warm. This practice helps you to feel the winter cold less keenly.

There are many times during every day when you will be glad to be clean. It is pleasant to come to school clean, wearing clean, neat clothes, and to work in a clean, fresh-smelling classroom. Before you eat, or before you handle food that anyone will eat, you want to wash your hands. You always need to wash your hands after using the toilet.

There is still another reason for the generous use of warm soapy water. Frequent and thorough scrubbing of the hands and fingernails with soap and warm water is a fairly good protection against the spread of disease. Just think of all the adventuring that your two hands do during the day, and then remember that these same two hands carry your food to your mouth. You can see that they might easily carry germs to your mouth unless they are frequently washed.

Study Activities

Finding the Reasons for Hand Washing

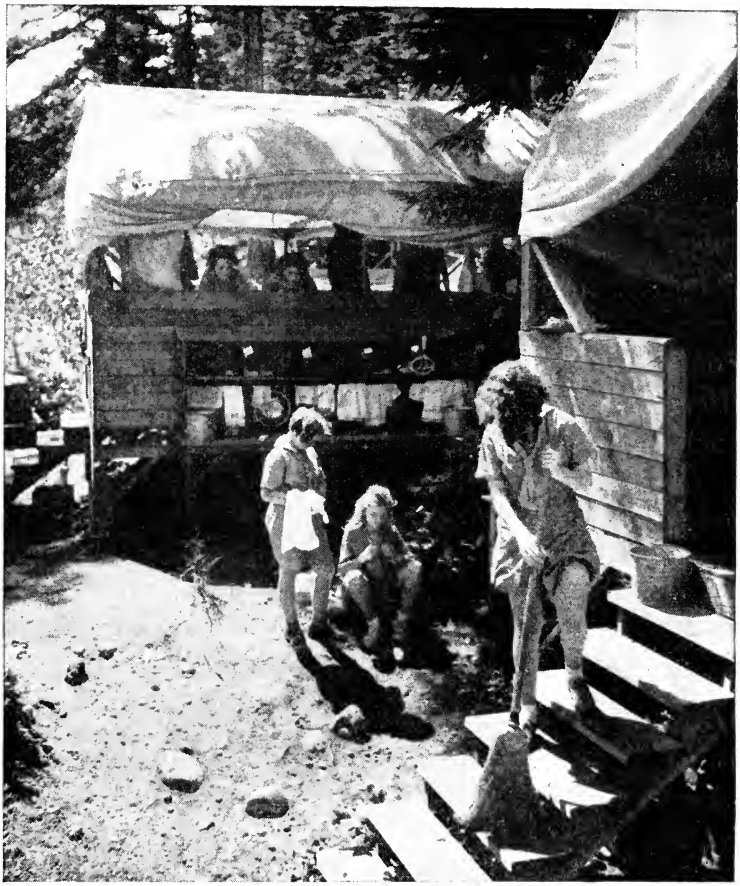
1. What You Will Need

Plenty of hot water and soap for your hand washing; 2 small smooth potatoes; a little red ink; a medicine dropper; 4 saucers; 4 plain glasses; 2 paring knives; a large pan; 2 small pans; heat.

2. What to Do

Put the saucers, glasses, paring knives, and medicine dropper into the large pan. Cover them with cold water; bring to a boil, and boil for twenty minutes. Then you can be sure that there is no living thing on them. In other words, they will be sterile. At the same time put half a cup of cold water into the other small pan. Add two teaspoonfuls of red ink. Bring to a boil, and boil gently, with the pan covered, for twenty minutes. Be careful not to let all the liquid boil away.

Meanwhile, scrub two potatoes, each of which you can cover with a glass, without letting the glass touch it. Put the potatoes into one of the small pans, cover with cold water, bring to a boil,



Ewing Galloway

KEEPING CLEAN AT CAMP. SHE WILL WASH HER HANDS WHEN SHE FINISHES SWEEPING. THE TOWEL RACK IS OPEN TO THE AIR AND SUN.

and boil ten minutes. The potatoes will be about half done.

When the dishes in the big pan have been boiled twenty minutes, turn the fire out. When the water has cooled enough, lift out two saucers. Be careful to touch only the very edges of the saucers.

If you cannot prepare everything at school, some members of the class may cook the potatoes and sterilize the dishes, paring knives, medicine dropper, and red ink at home. Bring the potatoes to school wrapped in a clean cloth that has been boiled. Take care not to break the potato skins. Bring the dishes wrapped in another clean cloth or towel. Bring the red ink in a bottle that has been boiled.

Cut one of the boiled potatoes in two, using one of the sterile paring knives. Touch only the handle of the knife. Be careful not to touch the cut surfaces of the potato. Put each half on one of the sterile saucers, cut side up. With the sterile medicine dropper, put one or two drops of the boiled mixture of water and red ink on the cut surface of each half of the potato. Let it spread and sink in, so that the entire surface is pink. Possibly three drops will be needed.

Let someone whose hands are rather dirty lightly rub two fingers in very small circles on the pink surface of one half of the potato.

Lift one of the sterile glasses from the pan, and shake the water from it. Touch only the outside of the glass, near the bottom. Cover the potato with it and label it "Unwashed fingers."

Let the person who touched the potato, wash

Photo by Pagano, courtesy of the Lever Bros.

IT'S WORTH THE TROUBLE TO BE CLEAN.

his hands thoroughly, with soap and hot water. Soap them very well and rub the soap in. Rinse in plenty of clean water. Do this two or three times. Let the hands dry in the air without touching anything. Then move two clean fingers over

the pink surface of the other half of the potato, in the same way. Cover this potato with a glass, and label the glass "Washed fingers."

Lift the other two saucers from the pan, and cut the other potato in two with the second sterile knife. Put drops of the boiled ink and water on the surface of each half, as before. Cover one half at once with a sterile glass and label this glass "Control."

Then let a member of the class cough on the other half potato. Cover it, and label the glass "Cough."

Put the four saucers with their covered potatoes in a warm, dark place, or in a warm place where they can be covered to keep out the light. Look at them after one day, and again after two days, from the time you prepared them. If you use plain, rather thin glasses you will not have to lift them to look at the potatoes.

3. What to Look For

In the dish labeled "Unwashed fingers," look for many little spots in the two circles made by the dirty fingers.

The dish labeled "Washed fingers" should not have any spots, or at least very few.

The dish labeled "Cough" will probably be well covered with spots. The "Control" potato should have nothing on it.

4. What Your Findings Tell You

The spots on the potatoes are colonies of bacteria which the hands have picked up during the day. Bacteria are plants so small that a single one cannot be seen without a microscope. There are probably thousands of them in each spot. Some of these bacteria are friendly; some are enemy bacteria, the disease germs. This tells you why it is a good thing to keep the hands away from the face, especially from the eyes and mouth. There is always a chance of picking up enemy bacteria on the hands.

Thorough scrubbing of the hands in hot, soapy water will remove most of these bacteria. If there are spots following the circles made by the washed fingers, it may be that you did not scrub your fingers well enough or that you touched something dirty after you washed them. If there is a ring of colonies around the edge of the potato, it may be that fingers touched the cut surface.

The fact that there were few or no bacteria colonies in the dish marked "Washed fingers" tells

you that one way to avoid putting unfriendly bacteria into your mouth, is to wash your hands thoroughly before you eat or handle food. As you know, soap and water, especially hot water, remove much more dirt than water alone, and the germs in the dirt are washed away with the dirt. Washing the hands after using the toilet helps to protect yourself and others from dirt and germs in body wastes.

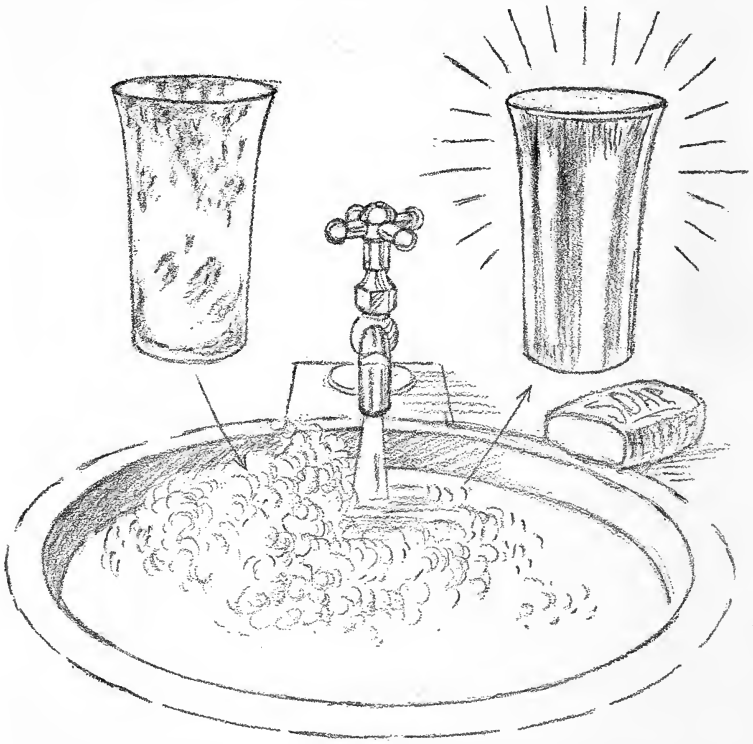
The dish marked "Cough" tells you why it is a good thing to wash your hands after you have coughed or sneezed into your handkerchief.

If there is nothing on the "Control" potato, it tells you that there were no germs inside the potato, or on the knife you used, or in the boiled ink.

When you are through with the potatoes, let them slide from the saucers into a paper bag without touching them. Put the bag with the garbage, or burn it. Boil the saucers and glasses before using them for anything else. Why should you do these things?

Clean or Sterilized?

A dish is clean after it has been thoroughly washed in hot soap and water, and well rinsed in clear water. The test for a clean dish is to dip



THE GLASS AT THE LEFT WAS WASHED IN COLD WATER. THE ONE AT THE RIGHT WAS WASHED IN WARM, SOAPY WATER.

it in water (distilled water is best). If the dish is clean, the water will not cling to it. It will all run off, leaving the dish dry. This is the test that workers in the science laboratories often use to make sure that the glass is clean.

A sterilized dish not only looks clean, but it has been treated so that there is not even one of the tiny plants (bacteria) living on it. A dish is sterilized by boiling it for twenty to thirty minutes, or by baking it in an oven for an hour. You sterilized the dishes for your test. If you had not sterilized them, there would have been spots (colonies) of bacteria at other places than those where you rubbed your fingers. Doctors and nurses use sterilized instruments and bandages.

Which one of the following words should be used in each of the blank spaces below? Clean, cleaning, sterilize, sterilized, sterilizing.

1. Baby's bottle should be boiled to.....it.
2. No bandage should be put on an open wound unless the bandage has been.....
3. One of the best ways of.....dishes is to scrub them well in soapy water and rinse them in scalding water.
4. One way to.....a house is to scrub it with soap and water and open it to the sunshine.
5. A good way of.....anything is to bake it for an hour, or to boil it for twenty minutes.
6. You can.....your hands by scrubbing them well in hot soapy water.

Courtesy of Life's Summer Camps

DID YOU EVER FOLLOW A STREAM TO ITS SOURCE?

Chapter II

SWINGING ALONG

Did you ever climb a hill in March when the first warm wind of spring was changing the snow-banks into tiny rivulets? The force of the wind made you fight for every step as you pushed your way against it up the hill.

Did you ever follow a runaway stream in the summer time, to find out where it came from and where it was going? You scrambled along the

banks, through bushes and over big rocks, to follow the stream's course.

You need a strong, fit body and good feet if you are to enjoy these vigorous walks. You need to

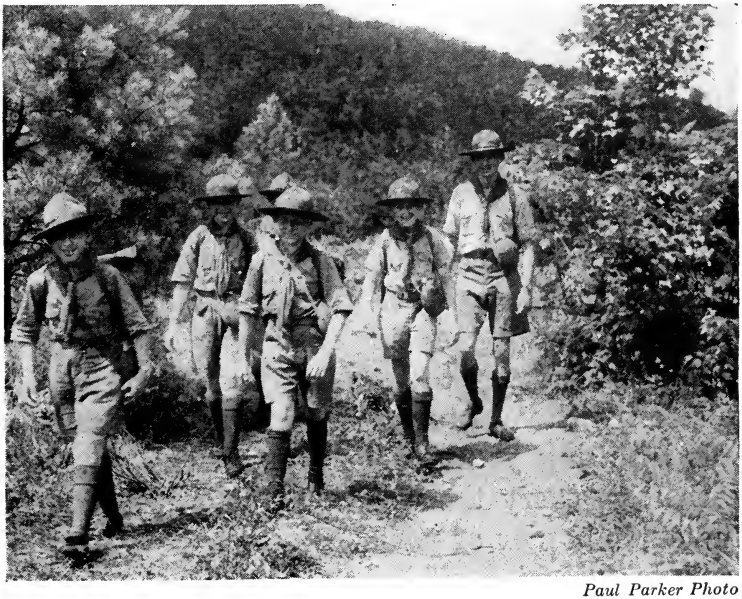
Courtesy of Adolf Fassbender, F.R.P.S., N. Y. C.

CAN YOU SWING ALONG AS EASILY AS THESE HORSES APPEAR TO BE DOING?

know how to walk at a good pace that takes you where you want to go without wasting energy.

Do you know what your pace is as you walk? How long does it take you to walk a mile, not

when you are hurrying to get to school, but when you are striding along easily, yet without wasting time? Test yourself several times on different days to see how long it really takes you. The



Paul Parker Photo

BOY SCOUTS KNOW HOW TO GET THE MOST ENJOYMENT OUT OF HIKES.

length of time it takes you to walk a mile when you are striding along easily, is your pace.

If you wish to increase your speed, there are two ways to do it. You may quicken your step,

or you may lengthen your stride. One good way to quicken your step without feeling hurried, is to learn some quick marching tune, and to hum it as you walk, keeping step with the music. Keeping step to a marching tune will also help you to maintain an even stride and an even step.

There are two ways in which you may lengthen your stride. The first way is to walk with your toes pointing straight ahead. Some girls and boys who tried this way, found that they were able to cover almost as much ground in five steps as they had done in six steps when they had walked with their toes pointing out. Try this plan and see what it does to your stride.

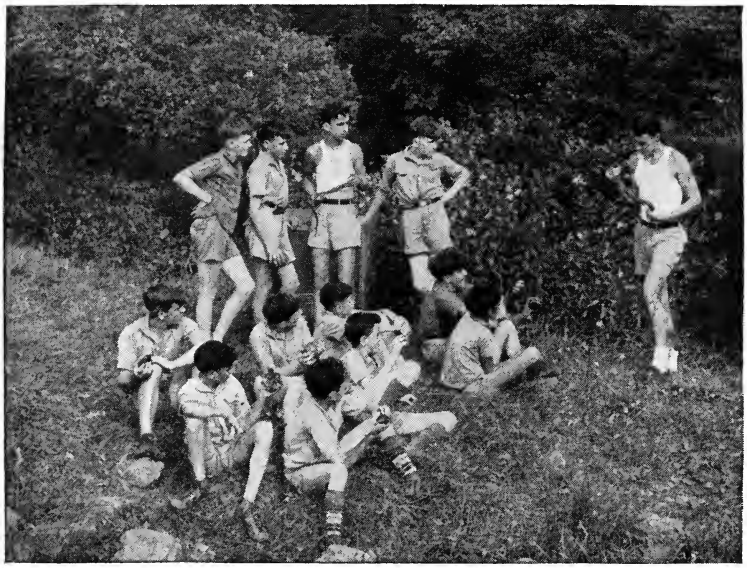
The second way to lengthen your stride, is to push off with your toes at each step. You can do this by using your whole foot in walking. At each step, carry the weight of your body along the outer border of your foot, from your heel to your toe, pushing off lightly as your foot leaves the ground. This push will give a sort of spring to your step that will carry your body well forward. If you are careful not to overdo when you push off, you will avoid the appearance of bobbing up and down that comes from giving too strong a push.

This way of walking will also strengthen your feet, and make it possible for you to walk greater distances without getting tired, than you could do with any other stride. Strong feet are necessary if you are to enjoy walking. If your feet are not strong you can help to make them so.

When you ran barefoot, no doubt you used your whole foot very well. If you have been wearing shoes with stiff soles, or high heels, you may have lost the habit of using your whole foot when you are walking. If you are to use your whole foot, the soles of your shoes must be flexible enough to bend easily. Furthermore, if you want strong and supple feet, your shoes should be broad enough to give your toes plenty of room, and long enough to allow your feet to slip forward a little in them.

Your foot will be stronger and you will be better able to push off at each step if your great toe is allowed to grow in a straight line with your foot. If the line of the inner border of the sole of your shoe is on a straight line with the inner border of the heel of your shoe, your great toe will stay where it belongs. Then your great toe will be more useful to you at each step than it would be if it pointed in. Moreover, a straight toe is much better looking than a crooked one.

When the heel of your shoe is as large as the heel of your foot, and when it is low enough to allow your weight to rest on your whole foot, you will be able to step firmly, and to carry your weight along the outer border of your foot. If feet could



Courtesy of Life's Summer Camps

THESE BOYS LIKE TO STUDY SNAKES ON THEIR HIKES.

be glad, such shoes would make them glad. At least such shoes will help you to step along with a stride that will gladden you.

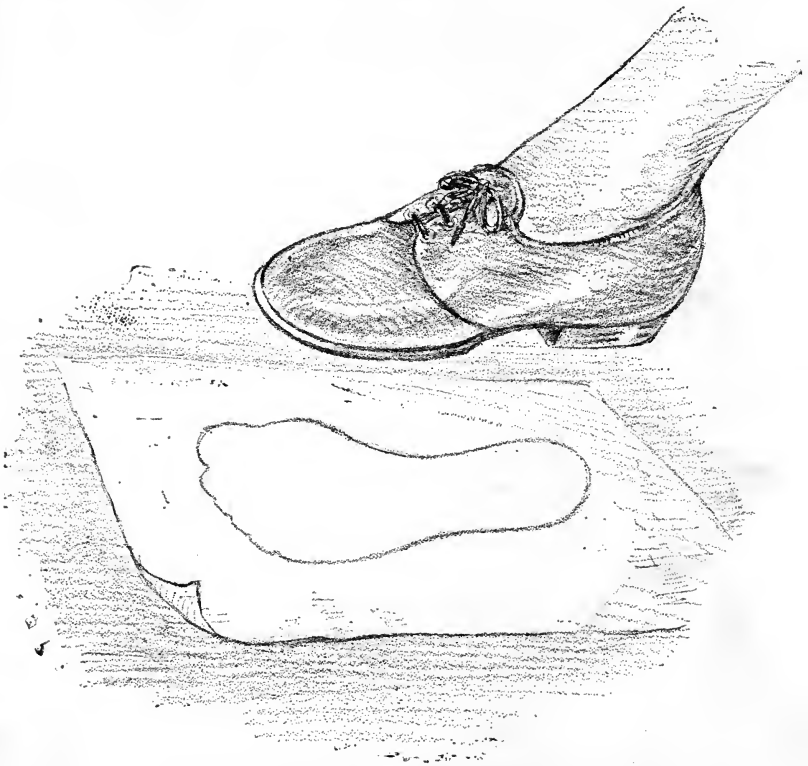
Another way to improve your stride and to increase your pleasure in walking is to carry your

weight properly when you walk. You should carry the weight of the body forward over the balls of the feet as if you were going to take a step ahead. Keep the head up without tilting the chin, and push up tall. You must do these things easily, without any stiffness, or strain, and without holding your breath.

Try carrying your body properly, without any stiffness or tension. Get ready to move forward and see how it helps you to carry your body forward easily at each stride.

You will find it easy to hold your body properly when you walk if you remember to hold it well at other times also. If you are to keep from getting tired at work or play, you must move about a great deal and change your position once in a while.

Whether you and the other girls and boys get fun from walking will depend not only on the easy stride you are able to use but also on the things you see. If you get a fine, easy stride, the more you walk, the more pleasure you will find in walking. Stopping sometimes, or strolling along slowly enough to enjoy the birds, or flowers, or other fascinating things that you may find in woods and meadows will add to your enjoyment.



DOES YOUR SHOE FIT YOUR FOOT?

Study Activities

Is Your Shoe Large Enough?

A. Stand on a sheet of drawing paper in your stocking feet and with a lead pencil trace the out-

lines of one foot on the paper as shown in the sketch on the opposite page.

B. Stand your shoe on the tracing of your foot. If the shoe covers all the tracing, the shoe is probably large enough for your foot.

Does Your Sole Have a Straight Inner Line?

Lay the edge of a ruler along the line of the inner border of the sole of your shoe. If the line of the inner border of your sole is straight, the edge of the ruler will also pass along the inner edge of the heel of your shoe.

Does Your Foot Have a Good Arch?

A strong foot has a good arch. Good arches help you to push off at each step. You can tell whether you have good arches by making prints of your bare feet. Do this by wetting your feet in water. Then step on a piece of blotting paper. The prints will show what parts of your feet touch the floor.

What Is a Good Sitting Position for Studying?

When you are working at your desk, sit well back in the seat and bend forward from your hips; then you will be able to keep a straight flat back. This position is especially restful after you have

been slouching low in your seat or bending your shoulders. You will probably change your position quite often without thinking about it. This helps you to keep from getting too tired. It will rest you to get up and walk about occasionally, in the house or outdoors.

A Hiker's Map

Have you seen the colored maps that have pictures to show the things of interest? Why not make such a map of the region in which you live, showing the pleasant roads and paths and the interesting places to visit? If you cannot draw well, perhaps you can find pictures in old magazines to cut out and paste on your map.

You will need to make a survey of the near-by country to find out where these roads and places are. Mark the spots on the map where you can get safe drinking water. The board of health sometimes marks safe water supplies in parks, camping places, and along country highways. On hikes to other places, you will need to carry your own drinking water. Water from unclean wells, springs, or streams sometimes carries disease germs. Such a map would be a fine thing to leave in your classroom for next year's class.

A MAP FOR HIKERS. YOU MAY GET IDEAS FOR YOUR MAP FROM THIS ONE.

Plan a Walking Tournament

The object of the tournament should be to find out which group of walkers can see the most interesting things, and take the greatest number of hikes. Have a committee select some one-mile stretches, some two-mile stretches, some three-

Courtesy of Life's Summer Camps

BOILING WATER TO MAKE IT SAFE TO DRINK.

mile stretches and one or two longer stretches for the most ambitious walkers. In some schools, it might be well to have a tournament last only a month. In others, it might last for a school year.

Watch your progress in being able to go on long hikes without getting too tired.

Some Athletics and Stunts to Try

Good feet will serve you well in games and athletic activities. What is your record in a standing broad jump? A running broad jump? A running high jump? Can you turn cartwheels or do a backward roll? Lean forward so that the hands almost touch the ground. Sit or fall backward, and as the hands touch the ground, throw the feet over the head and push up with the hands, and come to a standing position. Here is another stunt: Lean over and take hold of the toes of the shoes, grasping them between thumb and fingers. Hold them tightly, and jump backward and forward without letting go of the toes.

How many kinds of tag do you know? What other good running games are suitable for playing in your home neighborhood?

Nearly every one can learn to swim. Even if you do not have good feet, or cannot walk well, you may learn to be a good swimmer.

Chapter III

THE MAGIC OF SLEEP

Several years ago in India, many of the village people were dying of starvation. They had no money with which to buy food. A government official was sent out with bags full of silver money to give to the poor. The official set up a tent, and the people came to him for money. So many people came, that he sat for two days and a night giving out silver. On the second night he was so tired that he fell asleep while he was counting the coins. The money was lying in heaps beside him. The people were starving for lack of food. However, they believed that sleep was magic. No one ever wakened a sleeping person. So the hungry natives sat there all night, until the official woke up in the morning, and could go on handing out the money.

Perhaps few of us would think that one man's sleep is as important as that. Nevertheless, sleep is a magic. It is during the hours of undisturbed sleep that our bodies get the best rest. Then our bodies have time to grow and to make repairs.

NO ONE DISTURBED THE SLEEPING OFFICIAL.

A baby does little but sleep and eat. That is because he is very busy growing. Older boys and

girls do not grow so fast. Therefore, they do not have to sleep so much and they have more time to play. But the scientists say that when boys and girls are at the age when they play hard, they should have plenty of sleep. Boys and girls who are ten years old should have ten to eleven hours of sleep each night as a rule. Those who are twelve years old should have nine and a half to ten and a half hours of sleep, and often they may need more. You can tell what your bedtime should be, by figuring back from your rising time. If you get up at six or seven, and if you need ten hours' sleep, you should go to bed at eight or nine o'clock.

It is often restful and pleasant to read or to listen to good radio music in the evening, but such rest does not take the place of sleep. Boys and girls need plenty of rest for growth. Sleeping is the best way of resting. The nerves in our bodies are busy all day carrying the messages that help us to see, or hear, or think, or move. The nerves have a part in everything that we do. When we sleep the nerves have less work to do.

During rest and sleep the worn-out parts of nerves and nerve cells are repaired and the power to do work is given back to the nerves. During

rest and sleep the blood has the best chance to carry away the poisons and wastes that are thrown off into it. It is then that the tired muscles

Taken on Agfa Plenachrome Film

STOPPING TO REST IN THE SHADE.

are restored, waste material carried off, and new muscle built.

When you think of all the energy boys and girls ten or twelve years old use up in a day, you must know that the scientist is right when he says they need ten or eleven hours of sleep each night. You must know, too, that the longer and harder you work and play, the more rest and sleep you need.

It is well to form the habit of a regular and early bedtime, so that you will be ready to get the most out of the next day when it comes along.

To sleep restfully, it is best to sleep alone. Then you are free to move about in your sleep. That is why a sleeper is really more comfortable when he has a bed or cot to himself. Of course, many people sleep very well, even if they cannot sleep alone. A rather firm mattress is an aid to sound sleep, and it will add to your comfort if the sheets are pulled smooth and tight, and the covers tucked in firmly at the foot of the bed. If you use a pillow, it should be a small one which is placed under the head, but not the shoulders. It does not matter much what position you take when you go to bed, as long as you are comfortable and relaxed. You will probably move a good deal in your sleep and take different positions.

Cool air helps to make sleep refreshing. That is why sleeping porches are popular. If we sleep outdoors, we should use warm bedding and night clothes which keep us from being chilled. If we sleep indoors, we can open the bedroom windows so that the air can be kept cool, and moving.

A dark room is more restful than one with a light in it. Once the daytime clothes are off, and

the boy or girl slips into clean night clothes, the great magic is at hand—the magic of sleep.

Courtesy National Safety Council

CAN YOU MAKE A BED CORRECTLY?

Study Activities

Find Out Whether You Are Getting Enough Sleep

If you are already sleeping eleven hours, you probably need that much. Do not change your habit until you are quite a little older.

If you are in bed only ten hours a night, and have a hard time waking up in the morning, the chances are that you should go to bed earlier. If you are getting ten hours' sleep, but find it hard to go to sleep at night, perhaps you are too tired to sleep, and it may be that an earlier bedtime would help.

If you sleep ten hours each night, if you go to sleep as soon as you go to bed, if you wake up in the morning without being called, and if you get up promptly feeling rested and happy, the chances are that you are getting all the sleep you need.

It is well to remember that it does not pay to cut down on your sleep. Some boys and girls require more sleep than others.

Make a Plan for Your Day

Your plan should allow enough time to rest and work and play.

Allow time for as much sleep as you need.

Rest a half hour at noon each day, if you find that you often get tired or cross before the day is over.

Allow three hours for active outdoor play.

Allow an hour for quiet play or work or reading before bedtime.

Does your plan give you time enough in the morning to bathe, and to dress neatly? to clean your teeth? to eat your cereal and milk, toast, and fruit for breakfast? to take time for the toilet? to help mother with the dishes or in some other way? to enjoy the walk to school?

Keep a Record of Your Growth

Study the chart: "I AM GROWING UP." Get one for yourself, or make one. These are the directions for using the chart:

1. Weigh yourself each month. Have someone find your height in September, January, and May.
2. Write your height, weight, and gain in the proper spaces near the top of the page.
3. Look at Jean's chart. See how she made it: She weighed 71 pounds in September, so she wrote 71 on the broad black line at the

left of X. Then she wrote 72 on the line above, and so on. She numbered all the lines. Each month she put an X where her weight line crossed the month line.

I AM GROWING UP

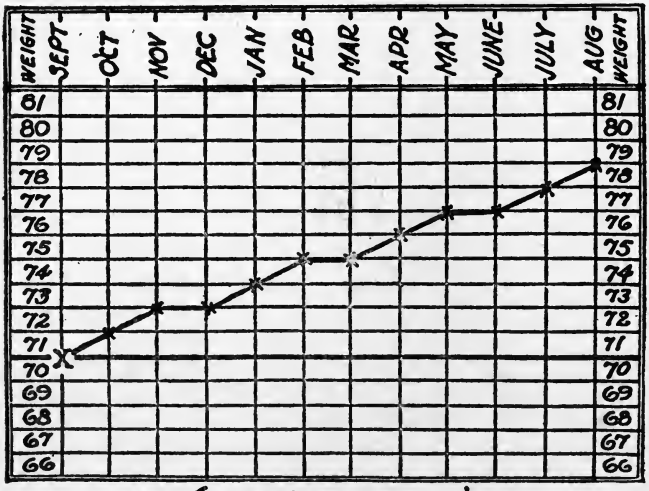
NAME_____ SCHOOL_____ GRADE___

DATE OF BIRTH_____ AGE AT NEAREST BIRTHDAY_____

_____ 19____ TO _____ 19____

	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
HEIGHT												
WEIGHT												
GAIN												

THIS IS HOW I GREW IN WEIGHT THIS YEAR



(JEAN'S CHART)

Prepared by Thomas D. Wood, M.D. and Anette M. Phelan, Ph.D.

Then she drew a line from each X to the next one. The slanting line shows how she grew that year.

4. Now look at your chart. Write your September weight on the broad line just at the left of the X. Write the next highest number on the line above, and so on. Number all the lines on both sides of the chart as Jean did.
5. When you are weighed in October, find the line on the chart which is the same as your weight. Put an X where that line crosses the October line. That X shows your October weight.
6. Draw a line from the September X to the October X. If you have gained in weight, that line will slant upward.
7. Make your chart month after month to show how you grow. Watch the line slant upward.

Keep a record of your growth for a year. Be sure that you weigh yourself about the same time each month. If your birthday is on the fifth of the month, why not choose that day for your weighing day?

Get a picture to show how you looked when you began your record; get another to show how you looked when the year was up. A comparison of these pictures should show your growth.

Are you growing in other ways? Can you make a better record in the 50-yard dash than you did last year? Can you throw a ball farther and straighter than you did last year?

Remember this: regular hours of sleep, restful sleep, and enough sleep are good aids to the boy or girl who wants to grow and get stronger.

Try These on Yourself

On a piece of paper, write the number of each sentence, with the letters following it, as: 1-a, b, c. Read the sentence and the three endings. Put a circle about the letter that is the same as the one before the right ending. When you have finished the test, find the sentence in one of the chapters you have read that shows whether you have marked the right ending.

1. The best air for restful sleep is

(a) cool, gently moving air.
(b) a good cool breeze blowing on you.
(c) warm air so you won't get cold in the night.

2. One way to lengthen your stride is
   (a) to try to walk fast.
   (b) to walk with your toes pointing straight ahead.
   (c) to hold your body stiffly.
3. Girls and boys from ten to twelve years old need to sleep each night, about
   (a) 8 to 9 hours.
   (b) 9½ to 11 hours.
   (c) 6 to 7 hours.
4. Washing the hands thoroughly with soap and water
   (a) kills the bacteria.
   (b) gives no protection against bacteria.
   (c) washes many of the bacteria away with the dirt.
5. A baby's bottle can be sterilized by
   (a) washing it thoroughly with soap and water.
   (b) rinsing it with scalding water.
   (c) boiling it in water for twenty minutes.
6. Good walking shoes should have
   (a) a stiff sole to support your foot.
   (b) a sole with a straight inner line, plenty of room in the toes, and a flexible sole.
   (c) a broad, high heel.

Chapter IV

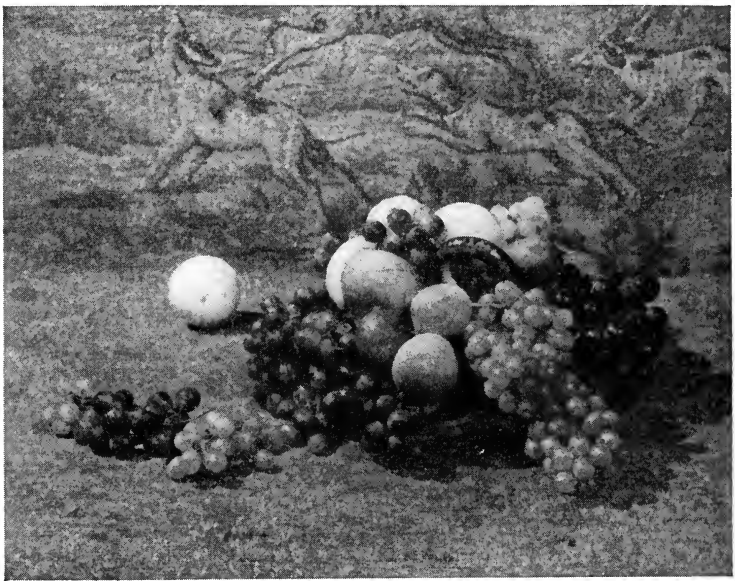
A SUGAR FACTORY IN THE BACKYARD

There is a brick factory across the river where big boats bring their cargoes of raw sugar from the sugar-growing countries. This raw sugar is refined in the factory, then it goes on the market as brown sugar, as powdered or granulated white sugar, or in other forms.

It is said that Americans eat their own weight in sugar every year. Nutrition experts tell us that most people eat too much sugar for their own good. People who get most of their sugar from fruit and vegetables keep in better trim than those who get too much from the sugar bowl or from other forms of refined sugar.

How does sugar get into fresh fruit and vegetables? That is the story of a very different kind of sugar factory, but a very real one. This sugar factory may be in the farmer's field or in any garden. In fact, wherever there is a blade of grass there is a sugar factory as surely as the grass grows green.

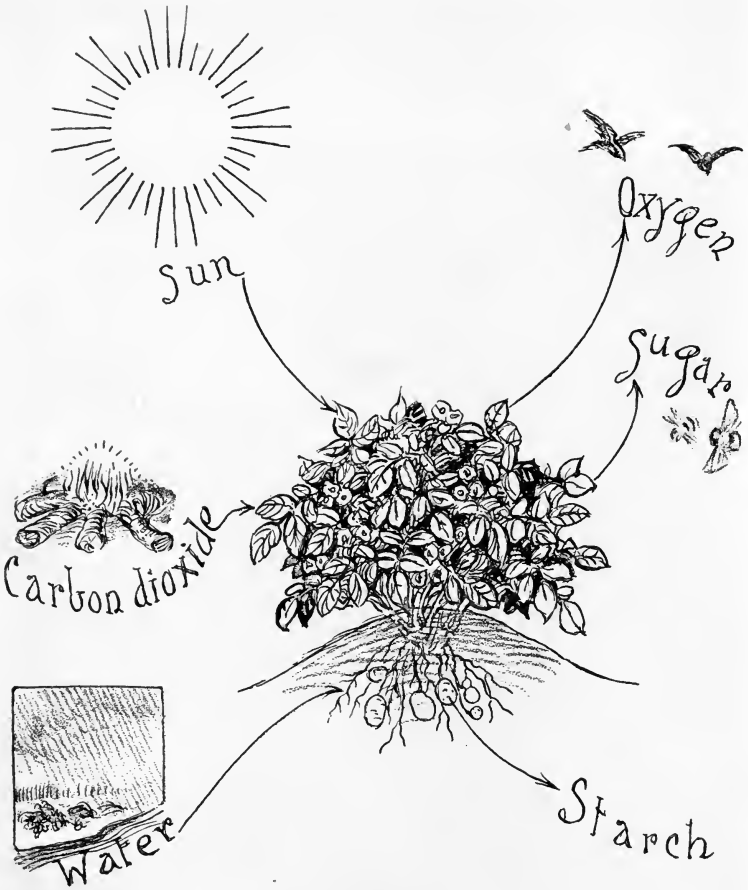
What material could a blade of grass find that it could make into sugar? Down through the ground the tiny rootlets of grass go searching for



Courtesy of Adolf Fassbender, F.R.P.S., N. Y. C.

A GOOD SUGAR SUPPLY.

water; up through the thread-like tubes of the plant the water rises until it reaches the place where the sugar is made. There it is mixed with the other raw material needed for sugar. This other material is a gas that the plant takes from the air. It enters the plant through very small



THIS DIAGRAM SHOWS WHERE THE POTATO PLANT GETS WHAT IT NEEDS FOR MAKING SUGAR AND STARCH.

openings in the leaves. It is the same gas that passes off into the air from burning coal or wood, the same gas that rises from the flame of a candle or a lamp. It is the same gas that we breathe out, and that fishes and all animals breathe out. It is *carbon dioxide.*

What kind of sugar factory could there be in a blade of grass? In many ways it is like the real sugar factory. In some ways it differs. The real factory was built at great expense, and floor after floor was divided into rooms that the work of sugar making might go on undisturbed. The leaf sugar factory has many layers of cells. The cells of each layer differ from those of the layer above or below it. It is in the second layer under the surface that the sugar is made. It is there that the water is mixed with carbon dioxide to make sugar.

The brick sugar factory hires many men and women who work eight hours a day. In the sugar factory of the leaf, the workmen stay twenty-four hours a day, but perhaps they do not work every minute of that time. We know for certain, though, that they do their best work when the sun is shining. The everyday name of the workers is *leaf green*; the business name is *chlorophyl.*

Photograph by A. Aubrey Bodine from Modern Photography 1933-4, published by The Studio Publications, Inc., N. Y. C.

A GROWING SUGAR FACTORY.

In the big factory many tons of coal are burned each week, and much electricity is used each day to furnish the power needed to run the machinery. In the sugar factory of the leaf, the workers get their power directly from the sun. The *leaf green* catches the sun's rays and uses them to make the water enter into a partnership with carbon dioxide. When the partnership is complete, sugar is made. If you doubt it go into the garden some sunny morning and pick a nice green pod off the pea vine; chew it well, pod and all, and see for yourself how sweet it is. The juice of a young stalk of corn or cane will taste sweet, too.

In the brick sugar factory, the sugar is neatly packed in little boxes and then stored away or shipped to market. The little factory in the leaf must store up every bit of its sugar and keep it for its own use. But in the plant there is not room to store up very much sugar in the leaves. Much of the sugar goes to other parts where it is stored as starch. How do you suppose that this change can be made?

You have noticed, of course, that dough or batter takes up much more room than the dry flour does. People who go on long camping trips on which they have to carry their food, take this into

account. They carry the driest food they can find: powdered milk, egg powder, dried fruits and vegetables, and so on. When they are ready to use the food they mix water with it.

The little plant has a way of taking the water out of the sugar and by so doing, changes the sugar into the new form in which it is stored in plants. The new form is starch. The starch is stored in the stalk and fruit, and sometimes in the roots of the plant. In some fruits, the starch changes to sugar again when the fruit ripens.

The plant makes the sugar and stores it away in the form of starch; and we eat the starch and change it back into sugar again for use in our bodies. Very soon after we eat rice, potatoes or other starchy foods the starch is changed back into sugar. The change from starch to sugar is begun by the saliva in the mouth. Saliva is the fluid, or juice, that flows in the mouth when your mouth "waters." After food has been chewed and swallowed, it stays awhile in the stomach, where for a time, the saliva keeps on changing starch to sugar. Other changes also take place, which do not affect the starch or sugar.

When food leaves the stomach, it goes into the small intestine. Intestinal juices complete the

change from starch to sugar in food that is being digested. By chewing, and by mixture with the digestive juices, much food has been changed into liquid form by the time it reaches the intestine. The sugar is dissolved and is in liquid form.

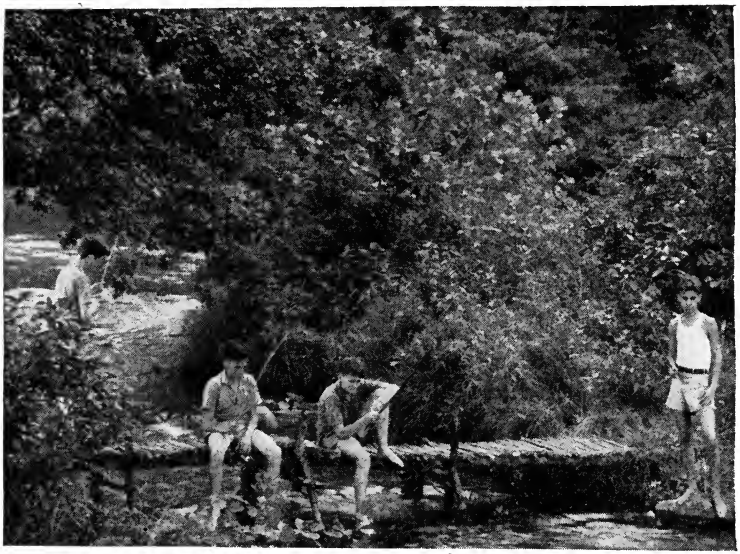
The liquid food passes through the walls of the intestine into small blood vessels or into the lymph. The lymph is one of the body fluids. Much of the sugar that is taken into the blood is sent at once to the muscles, which are always needing sugar.

In the muscles, another change takes place. The sugar is changed into water and carbon dioxide. But that is not all that happens.

When the sun's rays enter the leaf factory, they carry with them the *power to do work*. In the leaf factory the power was used to make the carbon dioxide and water enter into a partnership to form sugar. What became of the power to do work? It went into the newly made sugar. There it stays until the sugar is again broken down into carbon dioxide and water. When that change takes place in the muscles, the power to do work goes into the muscles.

When you run across the yard, the power of your running muscles comes from some sugar that was changed back into carbon dioxide and water.

When you lifted a pail of water, the lifting power came from some sugar in your lifting muscles. The power was set free when the sugar was changed back into carbon dioxide and water. This



Courtesy of Life's Summer Camps

RECREATION WHICH DOES NOT TAKE MUCH ENERGY.

happens in all the work that your muscles do: catching, batting, pitching the ball; climbing trees; swimming, or wrestling. The power to do work comes from the change of the sugar in the muscles.

The power to do work really comes from the sun. It is commonly called *energy*. Energy is

locked up in many foods. In fact, all foods give some energy except water and salt. Foods that are rich in sugar, starch, or fat may be called energy foods because they give the most energy.

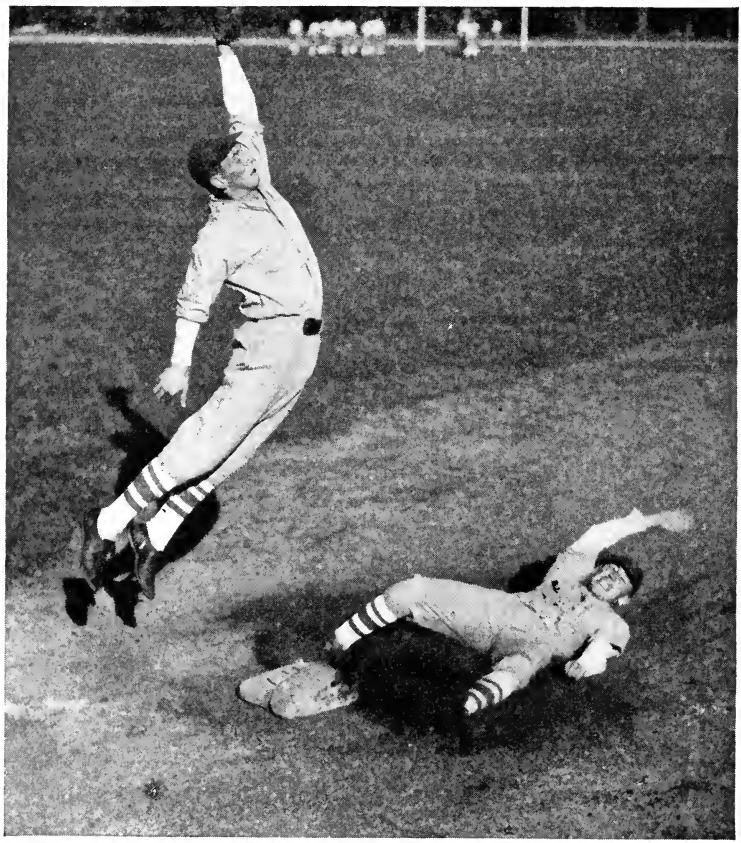
Sugar as used in the body is not the same as ordinary granulated sugar, but is in a simpler form. The granulated sugar in the sugar bowl is usually cane or beet sugar. Cane and beet sugar must be changed by the body into simpler forms before being used. The sugar in some fruits and vegetables is already in a simple form ready for the body to use.

Some energy foods rich in starch are rice, corn, potatoes, bread, and cereals. Bread and cereals are useful, inexpensive energy foods.

Foods that have fat in them are also energy foods. Butter, cream, fat meats, and olive oil are examples of fatty foods. It is chiefly in the intestine that fats are changed into a form that the body can use.

Five eighths of a measuring cup of milk contains an amount of energy that is sometimes called a share. The table on page 55 shows amounts of other foods that contain a share of energy. Growing, active boys and girls from ten to twelve years old, need enough food every day to give them

about twenty to thirty shares of energy. The older, larger, or more active boys and girls need



Courtesy of Williston Academy, Easthampton, Mass.

PLAYING BASEBALL TAKES A GREAT DEAL OF MUSCULAR ENERGY.

more energy than those who are younger, smaller, or less active. When you play vigorous games you use more energy than when you read or work

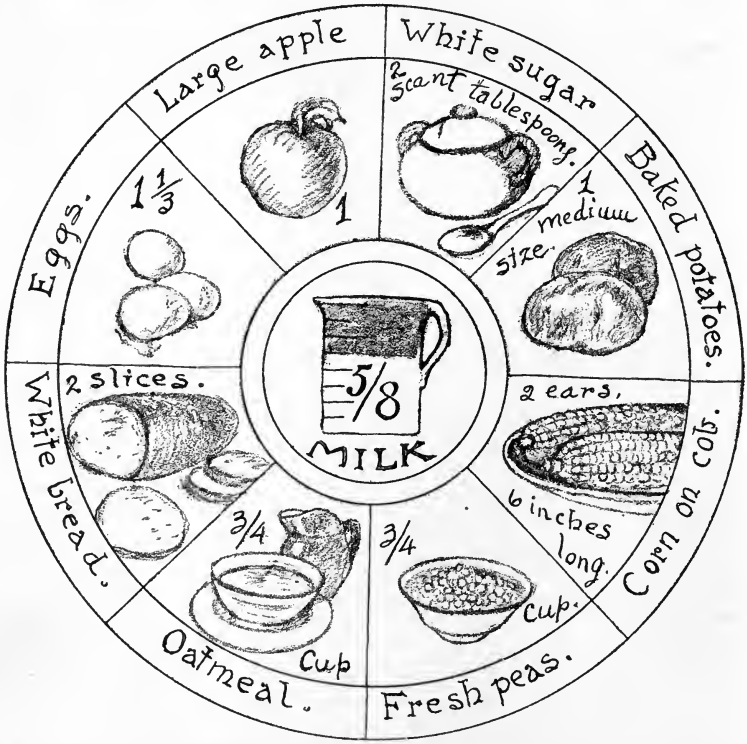
Courtesy of Adolf Fassbender, F.R.P.S., N. Y. C.

WILL THESE MEN EAT A LIGHT LUNCH OR A SUBSTANTIAL MEAL? WHY?

quietly. If you are out of doors very much in cold weather, you need more energy foods than when it is warmer.

The body uses a certain amount of sugar for the muscular work it has to do. When this need

is met, the body changes some of what is left into a form that can be stored away. Fruits and vege-



WHAT SIZE SERVING OF THESE FOODS YIELDS A SHARE OF ENERGY?

tables give other food values besides the energy. That is why it is much better for us to get our sugar from vegetables and fruits and grains,

rather than from the sugar bowl and the candy jar.

A Table of Energy Foods

Each of the foods in the servings given here has about the same amount of energy as that stored in *five eighths of a measuring cup of milk.* This amount of energy is sometimes called a share.

Name of Food	Size of Serving
Apple, fresh	1 large
Apple, baked	$\frac{1}{2}$
Apple sauce	less than $\frac{1}{2}$ cup
Banana	1 medium size
Beans, Lima, fresh or canned	$\frac{1}{2}$ cup
Beans, green, string	2 cups
Beef, lean	1 slice, $2\frac{3}{4}$ by $1\frac{1}{2}$ by $\frac{3}{4}$ inches
Bread, white	2 slices
Bread, whole wheat	$1\frac{1}{3}$ slices
Butter	1 tablespoon
Cocoa, made with milk	$\frac{1}{2}$ cup
Cookies, brown sugar	2 small
Corn, canned	$\frac{2}{5}$ of a cup
Corn muffin	$\frac{3}{4}$ of one
Corn on cob	2 ears, 6 inches long
Crackers, graham	$2\frac{1}{2}$
Crackers, soda	4
Custard, baked	$\frac{1}{3}$ cup
Eggs	$1\frac{1}{3}$

A Table of Energy Foods (Continued)

Name of Food	Size of Serving
Farina, dark, cooked	¾ cup
Fudge, chocolate walnut	1 piece, 1 inch by 1¼ inch
Gingerbread	1 thick piece, the size of a large square soda cracker
Grapefruit	½ large
Macaroni, cooked	¾ cup
Oatmeal, cooked	¾ cup
Orange	1 medium size
Peas, fresh	¾ cup
Pea soup, cream	a little less than ½ cup
Peaches, fresh	3 medium size
Peaches, canned	2 large halves and 3 tbsps. juice
Pears, fresh	2 medium size
Pears, canned	3 large halves and 3 tbsps. juice
Potatoes, mashed	½ cup
Potatoes, baked	1 medium size
Prunes, stewed	2 and 2 tablespoons of juice
Sugar, white	2 scant tablespoons
Sugar, brown	3 tablespoons

Study Activities

Prove That Plants Store Starch

1. What You Will Need

A potato, some cooked rice, white flour, cornstarch, and cooked oatmeal.

A bottle of iodine. Iodine is the starch finder.
Several small dishes.

2. What to Do

Put a little of each food in a separate dish. Make a moist paste of the flour. Do the same with the cornstarch.

Put one drop of iodine on each food.

3. What You Can See

Wherever there is starch, the iodine will make the food turn blue.

4. Using Your Facts

You have tried the iodine test on some of the energy foods among the grains and vegetables. In what parts of the wheat, rice, oats, corn, and potato plants was the starch stored? Try the iodine test on some other common foods. Then make a list of the foods that have starch in them. Put in your list only the foods you have tested.

Plan a Sugar Exhibit

Show the different sources of sugar, as: dried fruits that taste sweet; fresh vegetables that taste sweet; the starchy vegetables; the sugar trees;

the sugar gathered and stored by insects; plants used in the industry of sugar making.

Where Do You Get Your Energy?

Keep a record of all the food you eat for one day. Check the record against the table on pages 55-56. What kinds of energy foods did you have? Did you get most of your energy from breads and cereals? From candies, sugars, and syrups? Or from fruits and vegetables?

A Matching Test

Each of the items in the left-hand column below can be correctly matched by one of the items in the right-hand column. On a sheet of paper write down the letters a, b, c, d, and after each one write the number of the proper item from the second column which explains it.

(a) chlorophyl	(1) gas we breathe out
(b) energy	(2) contain sugar, starch or fat
(c) carbon dioxide	(3) power to do work
(d) energy foods	(4) leaf green

Chapter V

IRON MINERS IN THE GARDEN

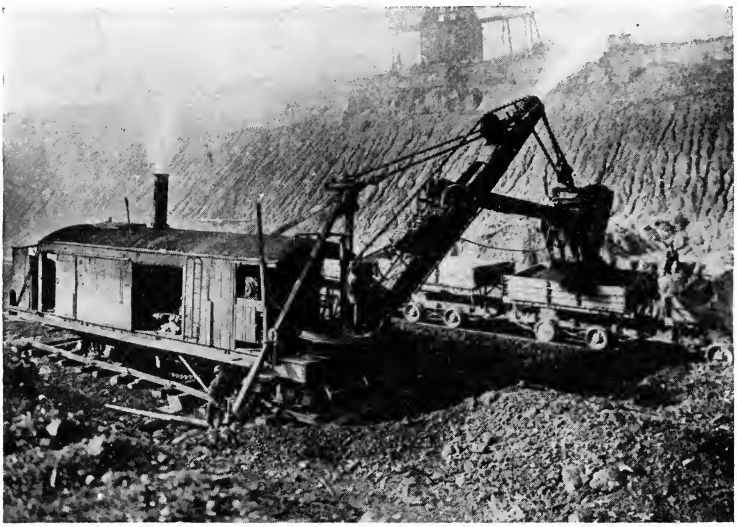
In the mining district of Minnesota, the iron ore lies near the surface of the earth. Great steam-shovels scrape off the top layer of earth that covers the iron. Then they scoop down into the pits, and come up with mouthfuls of reddish iron ore. Again and again the great shovels swing about; down into the pit they go, and come up with other mouthfuls which they drop into the hopper of a waiting car.

When a car is filled, it is switched to the side-track until many cars are ready. Then the train starts off toward the south, looking like some long black serpent with a red back. At Duluth or Superior, the cars give up their loads of ore to the big lake boats. These steam off to the east, pass through the locks of Saulte St. Marie, and then move down to the coal country where the ore is made into iron and steel.

It is a good thing for us that the iron we need in our food does not have to travel so far before

it comes to us. If it did, there would doubtless be fewer rosy-cheeked boys and girls in our schools.

The iron we eat comes from the soil also; but we do not need steam-shovels to get it out. It is



Ewing Galloway

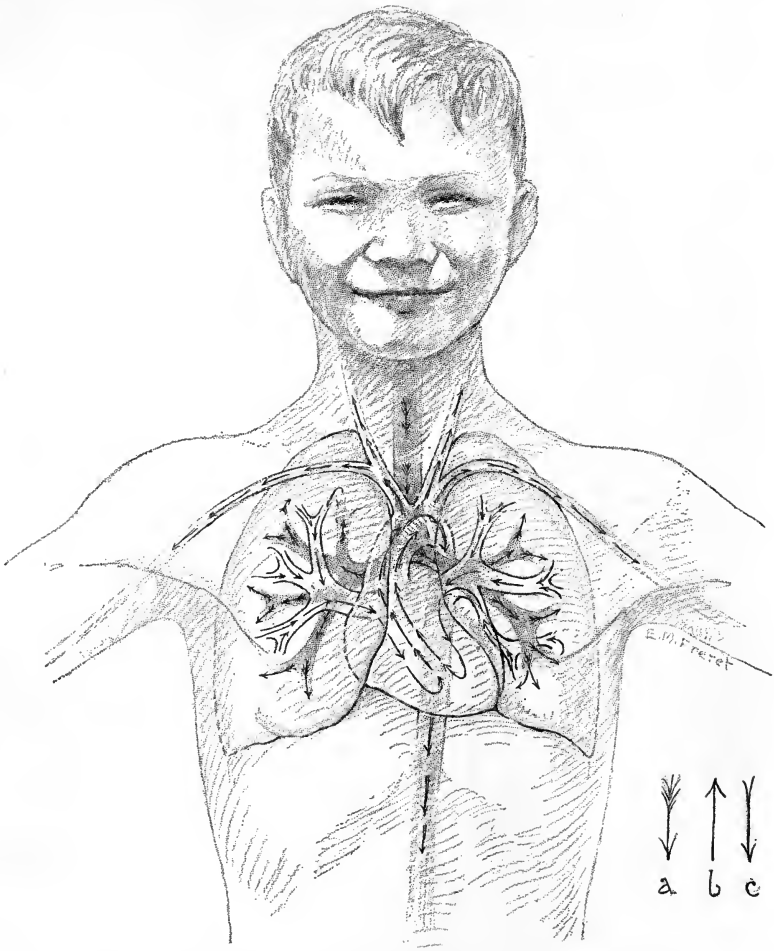
A STEAM-SHOVEL SCOOPING IRON ORE FROM AN OPEN PIT MINE IN MINNESOTA.

not in a form that could be mined by steam-shovels. It is well for us that it is not. We could not use it if it were in that form. Nevertheless, the iron we eat must be taken from the earth by iron miners. These miners serve the iron to us, all ready to use.

These miners are to be found in the grain field and the vegetable garden. Oats and wheat are good iron miners; so are potatoes and green peas. Lima beans are better yet. The best iron miners in the garden are young turnip greens and spinach.

These miners take iron out of the ground in the same way that they take out other minerals. The iron is in the water that the thirsty rootlets search out. It rises in the stalk of the plant in the water, and reaches the very tips of the leaves. It is well for us that the miners do their task so well and that there are so many of them, for we need iron in our bodies every day. It is hard to find anything to take the place of iron in machinery; nothing has been found to take the place of iron in our bodies. The great carriers that travel over land and sea are made of iron or of iron products. In our bodies, iron is also the important carrier. It carries a gas from the fresh-air station, the lungs, to all parts of the body where the gas is needed. That is one reason we must have iron.

The gas that our bodies need is in the air. We draw it into our lungs whenever we breathe fresh air. It is the same gas that fishes take out of the



THE BLOOD PICKS UP OXYGEN IN THE LUNGS.

The feathered arrows (a) show the course of the air to the lungs. The plain arrows (b) show the blood going from the lungs to the heart after it has picked up oxygen in the lungs. The split arrows (c) show the blood leaving the heart to go out through the body.

water to keep them alive. All animals need it. It is necessary for life itself. The name of the gas is *oxygen*.

Courtesy of Adolf Fassbender, F.R.P.S., N. Y. C.

HARD WORK AND PLAY TAKE PLENTY OF OXYGEN.

The oxygen enters the body through the lungs. It must be delivered to all parts of the body. In every part of the body where building is going on, oxygen is needed. There can be no building without it. It is also needed wherever energy (the power to do work), locked up in foods, is waiting

to be set free. The more energy we use, the more oxygen we need.

It is the iron in the blood that carries the oxygen to all parts of the body where there is a demand for it. The iron gets from the food into our blood when our food is digested. The digested food passes through the walls of the intestine into the blood or lymph. The iron in the digested food enters into the little red cells in the blood. It is the iron that makes the cells look red. Oxygen likes iron very much and goes to iron and clings to it until it comes near something it likes better. When the blood passes through the lungs, it picks up a good supply of oxygen. The oxygen holds to the iron in the little red blood cells. One thing that can take oxygen away from iron is carbon. Where will oxygen find carbon in the body?

When the blood is passing through the muscles, the oxygen is pretty sure to come near to some sugar. The oxygen leaves the iron of the blood cell and picks the carbon out of the sugar. Of course that breaks up the partnership that made sugar, because the carbon has gone off with the oxygen in the form of carbon dioxide. Then the energy that was locked up in the sugar is set free and the muscles have the power to do work.

The iron keeps moving, swept on in the blood. Back to the lungs it goes and picks up another supply of oxygen, which it delivers wherever the demand is greatest, and wherever there is something that can break the bond that holds the oxygen to the iron.

Do you know whether you are getting enough iron in your food? From what you already know, you can expect to get iron from whole-wheat bread or cereal, Lima beans, potatoes, green peas, and other green vegetables. You know that young turnip greens will give you more than any of the others. There is also iron in eggs and in meat.

The question of how much iron growing boys and girls need each day has been worked out by nutrition experts. Your needs for a day can be divided into parts or shares, and boys and girls of your age need at least twenty shares of iron every day. For example, you can get seven of the shares at breakfast time by eating a serving of oatmeal, an egg, four prunes, and a full glass of milk. You can get thirteen of the shares at dinner by eating a lamb chop, a baked potato, and a half cup of chopped cooked spinach. Of course you would not want to eat the same things day after day. On the next page is a table that

will tell you how much iron you may expect to get from common servings of food rich in iron.

Iron Table

Name of Food	Serving	Shares of Iron
Farina, dark, cooked	½ cup	2
Farina, light, cooked	same	less than one
Oatmeal, cooked	same	1
Turnip greens, steamed	same	9
Spinach, steamed	same	6
Cabbage, raw, chopped	same	1
Beans, green, Lima	same	3
Beans, green, string	same	1
Peas, green	same	2
Potatoes, white, mashed	same	1
Corn, green, cut off cob	same	nearly two
Banana, medium	one	1
Apple, medium	same	1
Egg	same	3
Lamb chop, small	same	3
Liver, piece 3 by 3 by ½ inches	same	12
Bread, whole-wheat or graham	one slice	2
Bread, white	same	less than one
Potato, baked, medium	one	2
Corn, green, on cob	1 large cob	1
Prunes, medium	4	2
Apricots, dried, stewed	9 halves	1
Oysters, large	3	9
small	8	9
Milk	1 quart	nearly five

Study Activities

Where Do Boys and Girls Get Their Iron?

Make a list of all the food which you eat in one day.

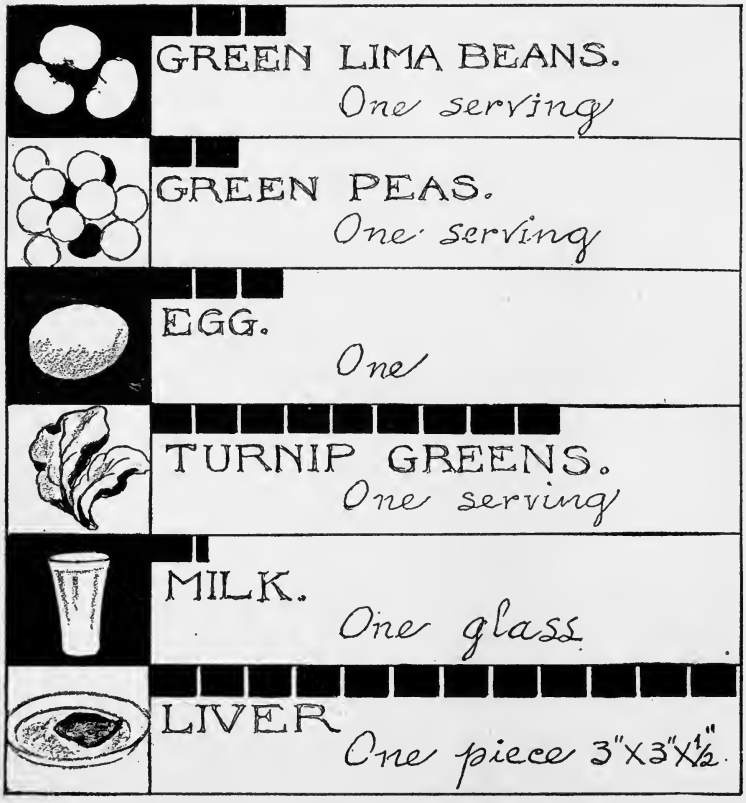
Pick out the foods that carry iron. Compare the amount eaten with the amount given on page 66. Add up the shares of iron in your list. Does each child get at least twenty shares? Do all the children eat the same kinds of food?

This might be one of the lists made:

Milk	1 quart	nearly 5	shares of iron
Farina, dark	½ cup	2	" " "
Graham bread toast	2 slices	3	" " "
Egg	1	3	" " "
Lima beans	½ cup	3	" " "
Green corn, on cob	1 cob, large	1	" " "
Apricots, stewed	9 halves	1	" " "
Potato, white, baked	1	2	" " "
Raw cabbage salad	½ cup	1	" " "
Small lamb chop	1	2	" " "
		23	shares

Put some of the lists up on the bulletin boards so other children can see how to choose food for iron. Look at the food listed in the school lunch room. What would it cost you to get all your iron-

bearing foods there? Which foods will give you the greatest iron shares for the money? Which cost the more, iron-bearing foods or energy



FOODS RICH IN IRON. FIND OUT FROM THE CHART ON PAGE 66 HOW MANY SHARES OF IRON EACH OF THESE FOODS CONTAINS.

foods? Is there an energy food that also carries iron?

If you have no school lunch room, and there is a restaurant near by, ask the restaurant-keeper to save you some daily menus for a week. In what different ways does the restaurant offer iron to its patrons?

Do Green Leaves Give Off Oxygen?

Fill a pint fruit jar half full of fresh green leaves. Young clover leaves are good. If it is winter, you may have to grow the clover. Then fill the jar full of water. Cover the jar tightly with a piece of flat glass. Turn it upside down in a pan of water and set the pan in the sun. Remove the piece of glass. Watch the bubbles of oxygen rise to the surface of the water in the jar.

When you have collected a lot of oxygen, slip the piece of glass over the mouth of the jar, and turn it right side up without letting any oxygen escape. Quickly put into the top of the jar a match or stick with a glowing tip. You should have enough oxygen in the jar to make the spark burst into a blaze. Oxygen in the air helps things to burn.

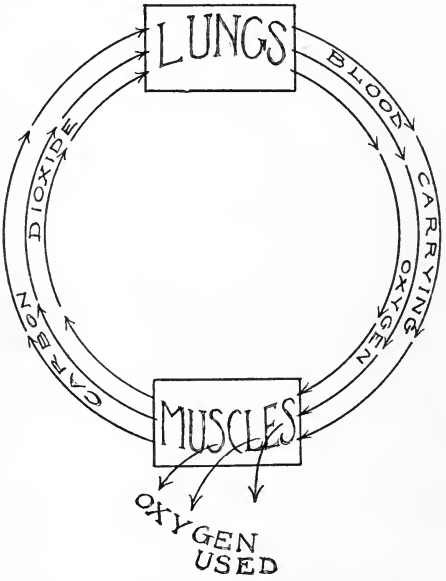
Photograph by H. Lacheroy, from Modern Photography Annual 1953-4, published by The Studio Publications, Inc., N. Y. C.

THE FISH AND PLANTS IN A BALANCED AQUARIUM HELP EACH OTHER.

Water Plants and Fish Help Each Other

In a balanced aquarium the fish breathe out enough carbon dioxide to supply the plants, and the plants give off enough oxygen to meet the needs of the fish.

A CHART TO EXPLAIN



FIND THE PARAGRAPHS IN THIS CHAPTER WHICH EXPLAIN THIS CHART.

Chapter VI

WHERE PROTEINS COME FROM

In the northern part of Chile, tucked away between the lofty Andes Mountains and the lower mountain chains near the coast, is a desert. It never gets a drop of rain. A blade of grass never grows on it. All day the hot sun burns the sand; all night the chill wind blows over it. Nevertheless, this desert has a fertilizer that all the world wants.

Hundreds of thousands of years ago the mountains that are now near the coast were down under the sea. When they rose out of the sea they carried some of the ocean with them and made a salt lake up between the mountains.

There was no chance for the water to drain off; and there were no rivers running into the lake. Neither was there any rain.

In the course of time, the sun dried up the water; and the drifting sands from the mountain sides covered up the skeletons of the fishes and other creatures and plants that had lived in the

lake. In the course of time also, the bodies of the dead creatures were changed into Chile saltpeter.

To get the Chile saltpeter the miners scrape off the layer of sand and loosen the rocks with blasts of dynamite. Then a great steam-shovel scoops

Ewing Galloway

MINING SALTPETER IN CHILE.

up the broken rock and drops it into the waiting cars that carry the rock to the refining plant where it is made ready for use.

Wherever large crops of corn or cotton are grown, saltpeter is needed. These crops take out of the ground something that saltpeter can give back. It is something that every growing crop and every growing thing need. It is *nitrogen*.

There is a great deal of nitrogen in the air, and men have found a way to capture it by using electricity. It costs a lot of money to get it that way, however, much more than to ship it from Chile. For a great many years the world has

Courtesy The National Fertilizer Assn.

THE COTTON AT THE RIGHT IS GROWING IN SOIL THAT WAS FERTILIZED. THAT AT THE LEFT IS GROWING IN UNFERTILIZED SOIL.

turned to Chile for the nitrogen needed for crops.

Some plants, like clover and alfalfa, can take their nitrogen from the air, but most plants get the nitrogen they need from the soil just as corn and cotton do. If there is any nitrogen in the soil it is in the water. The tiny rootlets of the plants take up the water containing nitrogen, which rises

in the stalk and reaches every part of the growing plant. The nitrogen makes the plant grow. A cornfield that has a good supply of nitrogen in the soil will yield twice as much corn as a field with a poor supply of nitrogen.

A 4-H Club boy in Arkansas made a record one summer. He used Chile saltpeter on his corn and cotton fields. His record book shows almost 4,000 pounds of cotton from one acre, and 128 bushels of corn from an acre.

Animals need nitrogen just as much as plants do. But they cannot get their nitrogen supply from the air or from the soil. Animals must get their nitrogen from plants or from animals that live on plants. Cattle fed upon plants that have a good supply of nitrogen grow bigger and stronger than cattle fed on plants poor in nitrogen.

Some farmers discovered that when a clover crop was plowed under, the field yielded a bigger crop than it did before clover was planted there. That was because the clover takes the nitrogen out of the air, and stores it in the lumpy places along its roots. Alfalfa also can take nitrogen out of the air, and make it ready for plant use. That is why these plants are good ones to make the land richer.

Farmers have learned, also, that they can use the same nitrogen over and over again. They raise large crops of corn and clover and alfalfa, and feed the crops to cattle and hogs right on their own farms. Much of the nitrogen the cattle and hogs get from their food goes right back to the soil in the manure of these animals, and is taken up by the crops grown on the soil over which the manure was spread.

Girls and boys need nitrogen just as much as plants and animals do. It helps them to grow.

RABBITS GET NITROGEN FROM CLOVER.

They would not grow without it. Like the animals, people have to get their nitrogen from the food they eat. Fortunately, nitrogen has a way of going into partnership with many other things,

Courtesy of Adolf Fassbender, F.R.P.S., N. Y. C.

A GOOD CATCH OF FISH. FISH IS A PROTEIN FOOD.

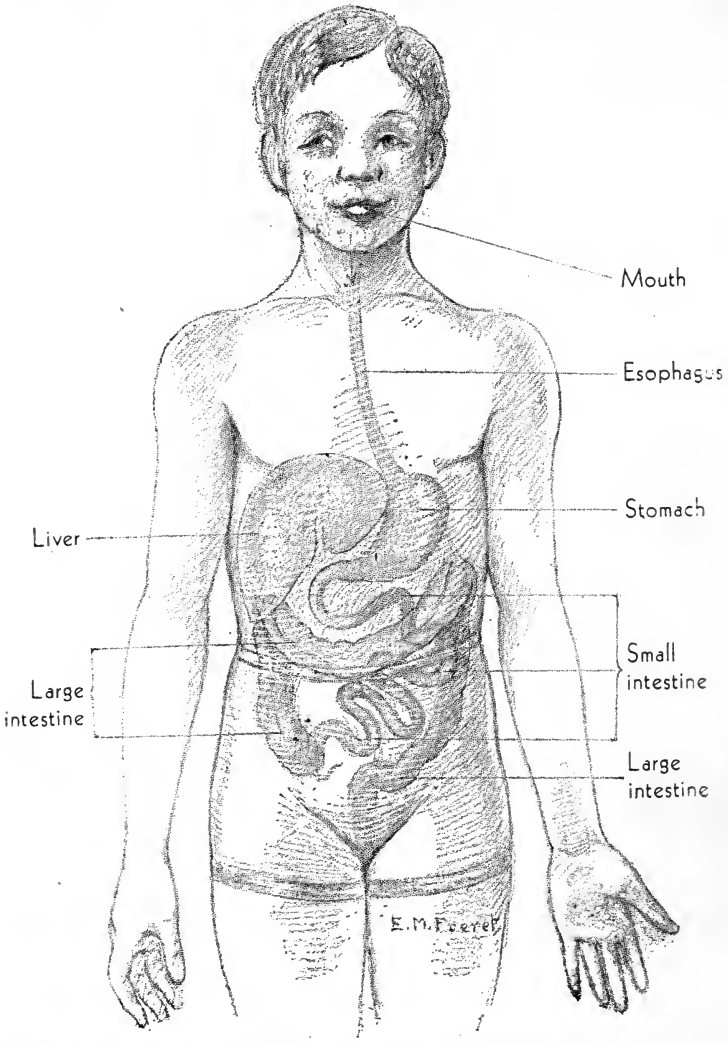
and in these partnerships, it is found in different foods. The nitrogen partnership in all foods has a special name. It is *protein*. Instead of saying that wheat has a nitrogen partnership, we say that wheat has a protein. There are many kinds

of proteins, and it is easy to get the protein you need. Corn has another protein; and nuts, peas and beans have still other proteins. Eggs and cheese give us good protein, and so does meat, because these foods have in them very good nitrogen partnerships. Fish is a protein food.

Before the body can use the proteins in foods, the proteins must be changed, or digested. Chewing your food is the first part of digestion, for thorough chewing breaks the food into small bits and makes it easier for the other changes to take place.

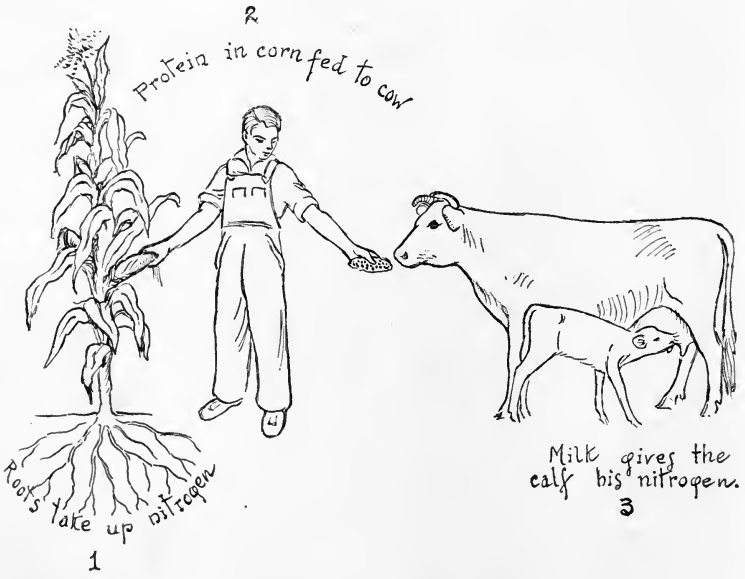
After you have swallowed your food, the juices in the stomach begin to change the proteins into liquids and to make other changes in them. Other digestive juices are mixed with the food after it has passed into the small intestine. These juices make more changes in the proteins.

You remember that plants can take nitrogen out of the soil and use it only when the nitrogen is dissolved in water. Your body can use proteins only when they have been changed, or broken down, into simpler materials in liquid form. Then the proteins can pass through the walls of the intestine into the small blood vessels, which carry them to the parts of the body that use protein food.



A SIMPLIFIED TRANSPARENT DRAWING OF THE DIGESTIVE SYSTEM OF THE BODY.

The proteins easiest for us to get and use for growth are in milk. That is one reason why milk is such good food for babies and for growing girls and boys. Milk with whole-wheat bread or cereal gives you one of the very best protein combina-



tions. Perhaps some of the very same nitrogen that came from Chile in the saltpeter was taken up by the corn, and in the corn was fed to the cow, and finally reached you in the glass of milk you had for breakfast.

The foods in the table below contain just about the same amount of protein (nitrogen partnerships) as there is in a glass of whole milk:

Protein Table

Name of Food	Amount
Navy beans, dried	a scant $\frac{1}{4}$ cup
Liver, cooked, ground	$\frac{1}{4}$ cup
Dried beef	two thin slices
Bread, whole-wheat	3 slices, large
Cheese, American	a cube $1\frac{1}{2}$ inches each way
Chicken	$1\frac{1}{2}$ small slices
Creamed codfish	$\frac{1}{2}$ cup
Peas, canned and drained	1 cup
Beefsteak	1 very small slice
Lamb chop	1 small one

Study Activities

Test Some Food for Nitrogen

Scouts, forest rangers, and other people interested in safety have made rules for the safe use of fire. Whenever you cook, or use fire, these rules should be followed. Read these rules before you do the nitrogen test experiment.

Keep matches in a metal box. Do not throw burned matches into the wastebasket, but put them in a tin can, or where a spark can not do any harm.

Pans should be set far enough from the edge of the stove, with their handles turned away from the stove edge, so that they will not be tipped over accidentally. Many people have been scalded by such an accident.

If you build an outdoor fire, choose a still day when there is very little wind. Build only a small fire. Scrape away dry grass and leaves for at least ten feet around the fire. Have a pail of water near. Do not leave the fire unwatched at any time. When you are through with the fire, put it out with water, and then cover it with dirt. Do not leave even one spark of fire.

Do this experiment only when there is an older person to help you use the stove or camp fire safely.

Observe these rules when you do any other experiments that call for fire.

1. What You Need for the Nitrogen Test

Some sort of safe stove or camp fire and a frying pan.

A feather, and some foods to test, such as a drop of egg white, a very small piece of meat, a spoonful of milk, a spoonful of sugar, a little butter, a dried bean, and a dried pea.

An older person to help you use the stove or camp fire safely.

2. What to Do

Burn the feather and notice how it smells. The strong smell of burnt feathers is the nitrogen smell.

Burn each of the other things, one at a time, and notice the smell of each. Does burnt sugar smell the same as burnt feathers? You know that it should not, for you know what sugar is made from. What other food does not smell like burnt feathers when it is burnt? Which of the foods do show by their smell that they have nitrogen in them?

3. How to Use the Facts

Which of the foods that you have tested are given to very young growing animals and children?

What makes this food necessary for babies and for the baby animals?

4. What Do Young Birds and Animals Eat?

What do the young chicks eat? Where do they get nitrogen to make feathers, and to help them to grow?

Where do the young robins get their nitrogen?

Where do the young calves, and colts, and pigs, and puppies, and kittens get their nitrogen?

5. What Nitrogen Foods Are Served at Home?

Make a list of the foods served at home for one day.

From how many different foods did you get your nitrogen on that day?

PUPPIES GET NITROGEN FROM MILK.

How Much Water Do You Drink?

You have learned that food cannot be used by the body until it is changed into liquid form. The body needs a great deal of water for this purpose and others. It also loses water all the time. Hold a small glass tightly over the palm of your hand for a few minutes. Where does the moisture come from that appears inside the glass? Do you drink, all together, from four to six glasses of water every day?

Chapter VII

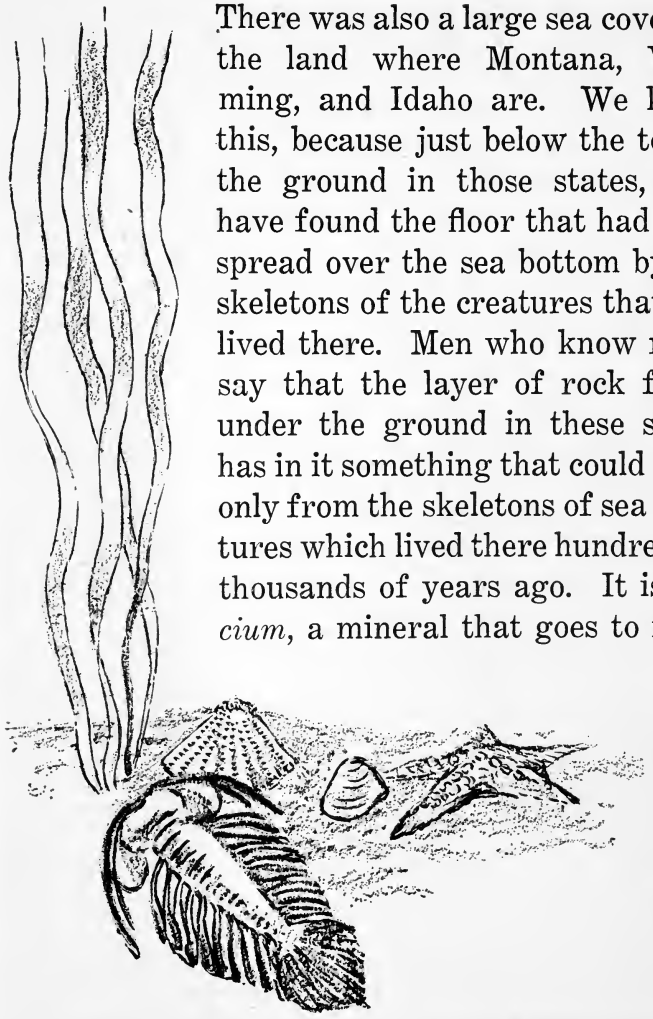
BONES AND OTHER THINGS

What becomes of all the fishes and other creatures that live in the sea? You know the story of the creatures in the sea that dried up and became a desert. You know also that the nitrogen that was in the bodies of those creatures went into partnership with other things to make Chile saltpeter.

Once you stop to think of it, you know that the creatures of the sea cannot live forever, even if the sea does not dry up. The bodies of the dead creatures drop to the bottom of the sea, and in time the bones and shells spread a floor all over the sea bottom. In time, too, the bones and shells fall apart, and the things that make them up enter into partnership with other things, just as the nitrogen went into partnership with something else to form Chile saltpeter.

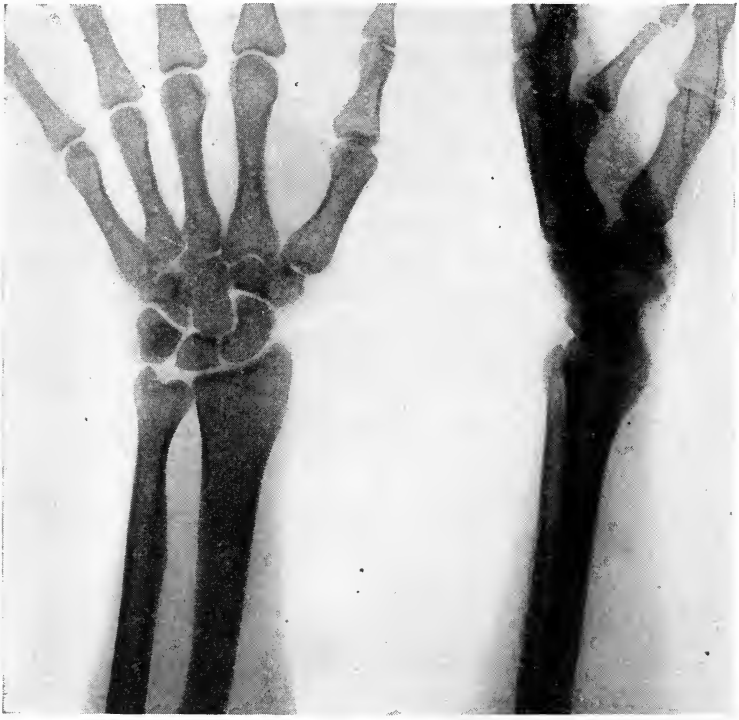
Thousands of years ago, there was a sea in the southern part of our country where the states of Florida, Tennessee, and South Carolina now are.

There was also a large sea covering the land where Montana, Wyoming, and Idaho are. We know this, because just below the top of the ground in those states, men have found the floor that had been spread over the sea bottom by the skeletons of the creatures that had lived there. Men who know rocks say that the layer of rock found under the ground in these states has in it something that could come only from the skeletons of sea creatures which lived there hundreds of thousands of years ago. It is *calcium*, a mineral that goes to make



CALCIUM DEPOSITS WERE MADE BY SKELETONS OF SEA CREATURES.

up all bones and shells. It is this mineral that gives strength and hardness to the bones, and gives hard-



Courtesy Bellevue-Yorkville District Health Center, N. Y. C.

AN X-RAY PICTURE SHOWING THE BONES OF THE FOREARM. AT THE LEFT IS A BACK VIEW; AT THE RIGHT, A SIDE VIEW.

ness to the floor which the skeletons spread over the bottom of the sea.

Courtesy U. S. Bureau of Home Economics

THIS RAT'S FOOD CONTAINED AN ADEQUATE AMOUNT OF CALCIUM.

Down in the bottom of the sea the calcium often leaves the partnership in which it is found in bones and shells, and goes into partnership with other things. When it chooses carbon, the two in a partnership may form limestone, or even marble. Sometimes the calcium stays in the partnership in which it is found in the bones. When this happens, the partnership forms rocky beds of calcium phosphate on the bottom of the sea. When the sea dries up, or when the water drains off, the calcium

Courtesy U. S. Bureau of Home Economics

THIS RAT'S FOOD WAS DEFICIENT IN CALCIUM.

Courtesy U. S. Bureau of Home Economics

THIS RAT'S FOOD CONTAINED A GOOD SUPPLY OF PHOSPHORUS.

phosphate beds are covered over with drifting sand or dust. In time the whole place is covered with plants and trees; and no one could tell by looking at it that it had once been a sea.

Probably some such change as that took place to cover up the great beds of calcium phosphate in this country. In the bed in Montana and the states near it, there are over two billion tons of calcium phosphate lying near the top of the ground.

The calcium phosphate from these beds is sold all over the world for fertilizer just as the Chile

Courtesy U. S. Bureau of Home Economics

THIS RAT'S FOOD WAS DEFICIENT IN PHOSPHORUS.

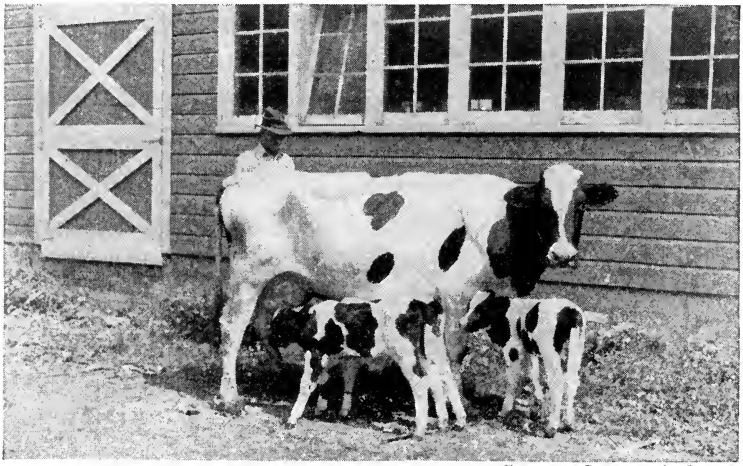
saltpeter is. It does not have nitrogen in it as the saltpeter has, because the rain soaking into the ground carried off the nitrogen years ago. Nevertheless, the calcium phosphate rock has two things in it which plants need. One is calcium; but even more than the calcium, the plants need the other thing in the calcium phosphate. No plant can live without it. It is *phosphorus*.

Most soils have some phosphorus in them, but when crop after crop has been raised on the same field, the phosphorus is used up and the farmer has to put some back into the soil. Calcium phosphate rock is ground fine, and mixed with the soil of the fields. After a time the acids in the soil break up the partnership between the calcium and the phosphorus, and change them into liquids. Then they are ready for the plant rootlets to take them out of the soil, for the use of the plant.

All plants use calcium and phosphorus, but all plants do not use the same amount of each. Corn takes a little calcium, and a lot of phosphorus. Mustard greens and turnip greens take very little phosphorus, and a great deal of calcium. The white potato takes very little of either.

Animals must get calcium and phosphorus from their food. In their bodies, some of the calcium

and the phosphorus join again in the old partnership and form calcium phosphate. In the body of the cow, for instance, some of the calcium phosphate is sent directly to the bones; and some is stored in the milk. In the bodies of all animals



Courtesy Dairymen's League

MILK WILL MAKE THEIR BONES STRONG.

that nurse their young, calcium phosphate joins in partnership with other things to form milk.

It is a pretty good thing for baby animals that the milk they drink has calcium phosphate in it, all ready for their use. The chief business of baby animals is to grow and to build bones. Calcium phosphate is the best bone builder known.

Within a few hours after the baby animal drinks his milk, the calcium phosphate finds its way into the blood stream, and is carried through the body. The walls of the bone are made up of a sort of network with many little spaces. The tiny blood vessels of the bones spread around into these spaces. When everything is right for it to do so, the calcium phosphate leaves the blood and settles into the tiny spaces in the network of the bones. Little by little the calcium phosphate goes into the bone and makes it firm and strong.

Hens do not nurse their young. The chickens have to get their bone-building materials some other way. Chicks fed milk every day will grow faster and larger than those that do not have milk. For the first few weeks, chicks have to build bones and feathers, and need the extra calcium phosphate they get from the milk.

Every person needs calcium phosphate every day. Like the animals we must get it from our food. Growing girls and boys need more than those who are grown up, because they are still building bones and teeth. When they were babies, girls and boys probably got all the calcium phosphate they needed, because then their food was mostly milk. However, when they began to eat

other foods, often the milk was crowded out. Tests have been made to find out just how much calcium phosphate each girl and boy should have

Photograph by Wm. M. Rittase from Modern Photography Annual 1935-36, published by The Studio Publications, Inc., N. Y. C.

THESE MEN HAVE STRONG, STRAIGHT BONES.

every day. An easy way to keep the right amount in mind is to remember this: A quart of milk a day will give growing girls and boys just the amount of calcium phosphate needed for strong, firm bones and teeth. On the next page is a table

of other foods in weights that will give about the same amount of calcium as one quart of milk.

Calcium Table

Name of Food	Amount
Bread, white	4 pounds
Cabbage	5 pounds
Celery	3 pounds
Lettuce	6 pounds
Oranges	5 pounds
Oysters	5 pounds
Peas, dried	3 pounds
Peas, green	8 pounds
Potatoes, white	16 pounds
Prunes, dried	4 pounds
Spinach	6 pounds
Turnip greens	Little less than a pound
Oatmeal, not cooked	$3\frac{1}{2}$ pounds
Cheese, American	5 thin slices, about 3 by 3 inches

From the grocery store, get the cost of each food in the table. Find the cost of a quart of milk. What would you have to pay each day, if you got your calcium from oysters? from cabbage? from green peas? from potatoes? How much of each of these foods makes a serving? Would you be likely to eat enough potatoes in one day so that you might depend on potatoes for calcium?

Which food gives you your daily supply of calcium for the least money?

Study Activities

What Is in a Glass of Milk?

1. What You Need

A glass of whole sweet milk.
A junket tablet (you can get this at any drug store).
Some form of heat.
An evaporating pan.
A piece of clean gauze.

2. What to Do

Set the glass of milk aside until the cream has risen to the top. Skim the cream off and put into a clean dish.

Set the glass of milk in water that is hot enough to make the milk lukewarm.

Crush ½ of a junket tablet, and dissolve it in a teaspoon of cold water.

When the milk is lukewarm, stir the junket tablet into it. Set away in a cool (not cold) place for twenty minutes. The milk should then be thick.

When the junket is set, cut across it three or four times, to set the whey free. Strain the whey

through the gauze into another glass, and hang the curd up to dry.

Taste the whey. It should be slightly sweet. That means that there is some sugar in milk. Chemists can separate the sugar from the rest of the whey, but it is easier for you to get a nickel's worth of milk sugar at the drug store, if you want to see what it is like.

Pour the whey into a sauce pan or evaporating pan and evaporate the water that is in the whey. What is left is sugar and the minerals.

Hold the pan over the fire until the sugar is burnt away. You can tell from the smell that sugar is there. What is left in the pan is the mineral in the milk. Most of that mineral is *calcium.*

Burn a little of the dry curd. The smell should tell you that there is nitrogen in the curd.

Follow the rules for safety in the use of fire. This experiment should be done only when there is an older person to guide you.

3. How to Use Your Facts

You can answer the following questions:

a. What part of the milk gives the fat?

b. Is milk an energy food? If so, in what part of the milk is most of the energy found?

c. Is milk a protein (nitrogen) food?
d. Is there any mineral in milk?

You can write a paragraph telling why you know that milk is a good food.

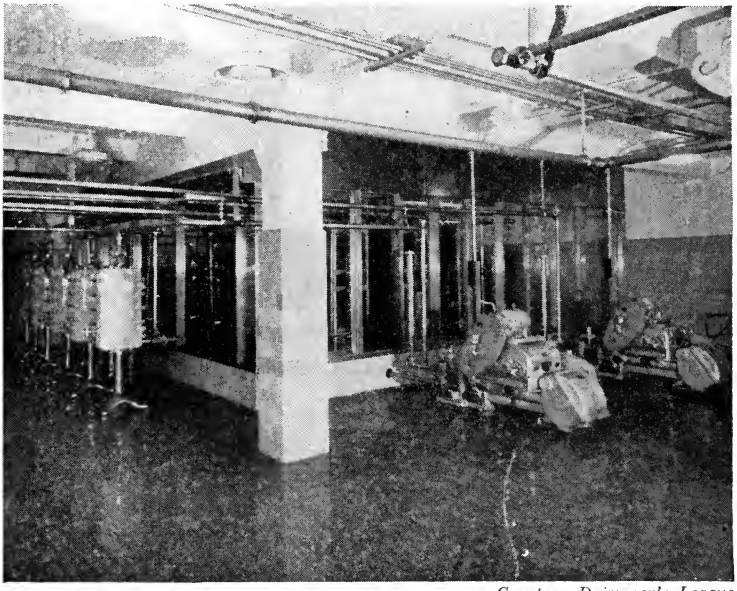
You can make an exhibit showing what is in a glass of milk.

a. Curd, the protein (nitrogen partnership) 1¾ tablespoons.
b. Mineral, mostly calcium.
c. Water, whey, ⅞ of a cup.

Keeping Foods Safe and Clean

Because milk is such an important food, it must be kept clean and safe to use. High heat and cold are enemies of bacteria. They are used to make milk safe and to keep it so. Milk is pasteurized by heating it to 145 degrees Fahrenheit and keeping it at this temperature for thirty minutes to destroy dangerous germs. Then the milk is quickly cooled to a temperature at which germs do not grow quickly. It is shipped in refrigerator cars or trucks, and should still be cool when left at your door. If you put it promptly in a cold refrigerator, the germs have little chance to grow, and the milk stays sweet a long time.

Fill two clean glasses with milk from the same bottle. Cover each glass. Set one glass in a warm place, and put the other in a refrigerator. How long is it before the milk in each glass begins to sour?



Courtesy Dairymen's League

MACHINERY FOR PASTEURIZING MILK. LOOK UP THE WORD *PASTEURIZING* IN THE GLOSSARY.

When your mother cans fruits and vegetables, she heats the jars, and the fruits and vegetables. Ask your mother how long these canned foods will

keep without spoiling. What may be the reason why the food in some jars spoils more quickly than that in others?

Try These on Yourself

Here are some statements, some of which are true, and some of which are untrue. See if you can tell the true from the false. *T* stands for *TRUE*; *F* stands for *FALSE*. On a sheet of paper, write down the number for each statement. Put a *T* and an *F* before each number. Read the first statement. If you think that it is true, make a circle around the *T* on the same line with the 1 on your paper. If you think the statement is not true, put the circle around the *F*. Do the same with each of the other statements. When you have marked all the statements, read the past few chapters to find the sentences that tell whether the statements are true or false.

T F 1. The rootlets of the plant take up the iron in the water they get from the soil.

T F 2. All plants store up the same amount of iron.

T F 3. Girls and boys need twenty shares of iron each day.

T F **4.** Much of the power to do muscular work comes from breaking sugar partnerships.

T F **5.** An egg is richer in iron than a baked potato.

T F **6.** The plant takes carbon dioxide out of the air, and gives oxygen to the air.

T F **7.** The plant makes sugar in its roots.

T F **8.** Sugar is made when carbon dioxide and water form a partnership.

T F **9.** The energy we spend in running comes from the food we eat.

T F **10.** There is always plenty of nitrogen in the soil for the plants.

T F **11.** The nitrogen in Chile saltpeter came from the rain water.

T F **12.** The nitrogen partnerships in food are called proteins.

T F **13.** The proteins in milk are the easiest for us to use.

T F **14.** Animals do not need calcium.

T F **15.** We get most of our calcium from the water we drink.

T F **16.** The calcium phosphate in milk is the bone builder.

Chapter VIII

THE DISCOVERY OF VITAMINS

I. Vitamin D

You know that the calcium laid down in the network of tiny spaces in the bones and teeth makes them strong. You have read that the best place to get the calcium is from milk, for in milk the calcium is in partnership with phosphorus, just as it is in the bones. If you have made the test on milk, you have seen the minerals that are in milk. It does seem that when you have drunk your quart of milk a day, you have done your duty by your teeth. For a long time, people thought so.

Then one day someone made a discovery. Some children drank their quart of milk each day, but the calcium did not stay in the bones, as it was supposed to do. Many doctors got busy. They tried to find out why it was that the calcium would go to the bones of some children and stay there, and would not do it with all children. They studied many children. All the children had the same

amount of milk. In some, the bones grew strong and firm, but in others they did not. What could be the answer?

From Hodges, P.C., Phemister, D.B., and Brunschwig, A.: Roentgen-ray Diagnosis of Diseases of Bones, in Diagnostic Roentgenology, New York, Thomas Nelson & Sons, 1936.

AT THE LEFT, X-RAY OF THE KNEE BONES OF A TEN MONTHS OLD CHILD SUFFERING WITH RICKETS; AT THE RIGHT THE SAME BONES IMPROVED AFTER TREATMENT WITH VITAMIN D, A CALCIUM HELPER.

Over in England, a man tried to answer the question by feeding puppies. He found that when he fed the puppies only cereal and skim milk, their bones did not get enough calcium, no matter how much milk the puppies drank. The puppies became sick. He added some cod-liver oil to their food. The sick puppies got well. He gave cod-liver oil to his well puppies. They did not get sick. He found that when the puppies had cod-liver oil with their milk and cereal, their bones became strong. Then the man said: "There is something in cod-liver oil that is a calcium helper."

The next year in our own country, two doctors began to study all the children who came to their office. Some of the children's bones were not getting enough calcium. These doctors found out also that when the children were given cod-liver oil every day, the bones became strong and firm again after a while. They said: "Cod-liver oil has a calcium helper."

Then all over the country, the scientists tried to find out what it was in cod-liver oil that helped the calcium. These scientists fed white rats. Some rats were given butter fat, some were given cod-liver oil, some were given egg yolk. At last the scientists said: "There is surely something in

cod-liver oil and egg yolk that will help the bones store calcium. We shall call it vitamin D." Vitamins A, B, and C, which you will soon study, had already been named.

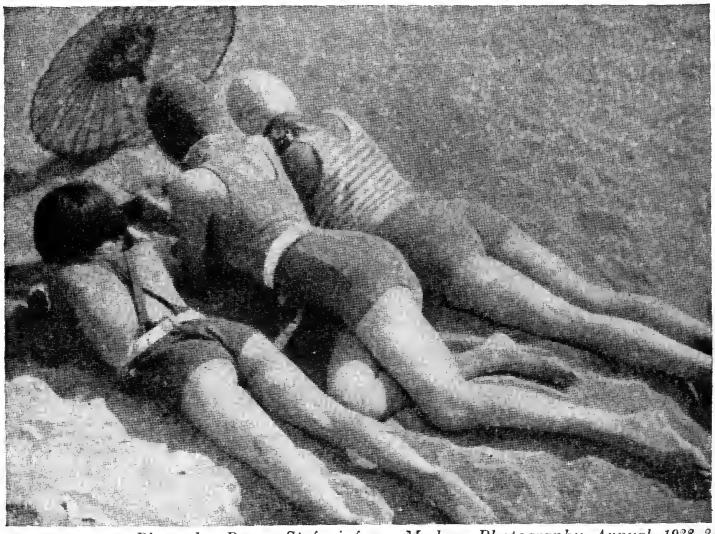


Photo by Bruno Stefani from Modern Photography Annual 1933-34, published by The Studio Publications, Inc., N. Y. C.

ENJOYING SUNLIGHT, THE CALCIUM HELPER.

Just about that time, someone noticed that children who spent much time outdoors in the sunshine, had strong bones, without taking cod-liver oil. A New York doctor began to study some rats. He fed some of the rats milk and cod-liver oil. Some, he fed milk, and no cod-liver oil. Some, he

fed milk, and kept in cages out in the sunshine. The rats that had cod-liver oil, and those that were kept out in the sunshine, had strong, firm bones. The X-ray pictures showed that the rats that had no cod-liver oil, and no sunshine, did not have enough calcium in their bones. Then the doctor said: "Rats can make their own vitamin D if they are kept out in the sunshine, and the vitamin D they make is just as good a calcium helper as the vitamin D in cod-liver oil."

It was not long before many tests all over the country showed that children and rats and chicks and pigs could make their own vitamin D if they were kept out in the sunshine. The tests also showed that the sunshine of the summer months made the most vitamin D. The scientists discovered that when the sunshine had to pass through glass before it reached the children's bodies, it did not seem to make as much vitamin D.

Then someone discovered that when hens were kept in the sunshine, their eggs had almost ten times as much vitamin D in them as eggs from hens kept in a coop.

So the scientists say: "Growing children need a quart of milk a day to give them the calcium they need for their bones and teeth. They need vitamin

D to help the bones and teeth store the calcium. They can get vitamin D from cod-liver oil, or from egg yolks. They can make their own vitamin D in summer if they stay outdoors a good deal. During the winter, when children get less of the sunshine that helps them make their own vitamin D, they can get the vitamin D they need from an egg yolk a day."

Since the scientists found that we can make our own vitamin D, if we get enough sunshine, men have been spending much time in the study of the sun's rays. The rays of light come in waves, and we can see only those rays that are of a certain wave length. There are rays too short for us to see which will change photographic plates or films.

Scientists are now able to measure the length of the light waves. If you wish to get an idea of the length of the different kinds of waves, you might get out your ruler and a very sharp pencil. Draw a line three eighths of an inch long; divide the line into two equal parts; then divide each half into five equal parts. This will give you a line divided into ten equal parts. Each part is very short indeed; in fact, the only way you can tell that there is any length between the dividing marks, is to use a very hard, sharp pencil to make the marks.

Yet the men who have been studying the wave lengths of light rays have been able to divide each of these ten equal parts into a million parts.

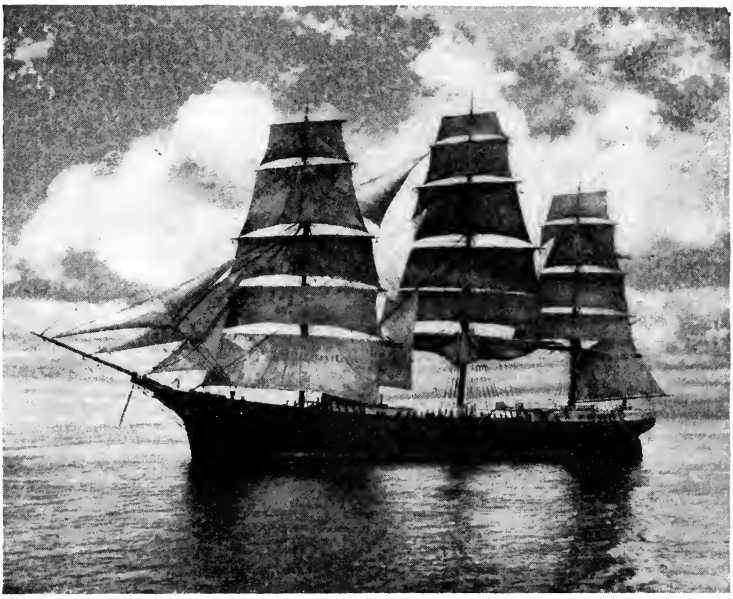
Scientists tell us that one of the ten equal parts of your line is about 1000 times as long as the wave length of the long heat rays of the sun. They say one tenth of your line is about 2000 times as long as the wave length of light that we can see. One of the ten equal parts of your line is about 4000 times as long as the wave length of the rays that help us to make our own vitamin D. These are the ultra-violet rays.

These men found out also that we get the greatest number of ultra-violet rays from the first of May to the first of September. In this country, except in the South, we get very few ultra-violet rays from December to March.

Use the sunlight every day that you can. Remember it helps you make your own vitamin D.

II. Vitamin C

Years ago, in winter when the food of people was mostly bread and meat, many people suffered from a disease called *scurvy*. In the spring when the green things grew in the gardens and fields, the sickness would clear up. The sailors and



Ewing Galloway

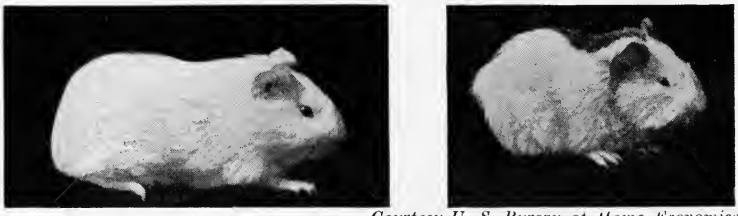
IN THE DAYS OF SAILING VESSELS, SCURVY WAS COMMON AMONG SAILORS.

soldiers suffered most. In some wars more men died of the disease than on the battlefield. No one was able to find a cure for scurvy.

A doctor in the English navy determined to find some way to save his men from scurvy. He tried a test on some men who were sick with scurvy at the time. He gave all the men the same food; then added one thing to the food of some and something else to the food of others. Two of the men

drank a quart of cider every day; two more took a spoonful of vinegar each day; four men drank a cup of sea water daily; and two men ate two oranges and a lemon each day. Some of the other men ate a mixture of seeds, and others drank barley water.

Within six days the men who ate the oranges and lemons were almost well. Then the doctor



Courtesy U. S. Bureau of Home Economics

THE HEALTHY GUINEA PIG AT THE LEFT GOT ENOUGH VITAMIN C IN HIS FOOD. THE GUINEA PIG AT THE RIGHT DID NOT GET ENOUGH VITAMIN C.

gave oranges and lemons to the other ten men. They, too, got well. From that time on, every British ship carried lemon juice to protect sailors against scurvy. In those days lemons were called limes, and the British sailors were nicknamed "Limies." Even today that name is often given to the British sailors.

The scientists spent much time studying the foods that seemed to prevent and cure scurvy.

They decided that there was something in orange juice, grapefruit juice, lemons, and tomatoes that not only cured the disease, but that would prevent it. They were not able to separate it from the other things in those foods, but they knew it was there. They gave the name *vitamin C* to the thing in those foods that cured scurvy. Now chemists can separate the vitamin C. They have found it in many raw fruits and vegetables.

Then someone who was feeding guinea pigs to study scurvy noticed that long before there were any other signs of scurvy in the pigs, their teeth began to decay.

The man gave the pigs some of the food that had vitamin C in it. The food did not seem to stop the decay of the teeth. He said: "Perhaps I am not giving the pigs enough vitamin C." So he doubled the amount of vitamin C which he gave to the pigs. Soon the decay of the teeth stopped.

Would vitamin C stop the decay of children's teeth? Doctors and dentists and nutrition experts began making tests and experiments. That study is still going on, and it begins to look as if the decay of children's teeth can be prevented. Children need the calcium that they can get from a quart of milk a day, so that their teeth can be

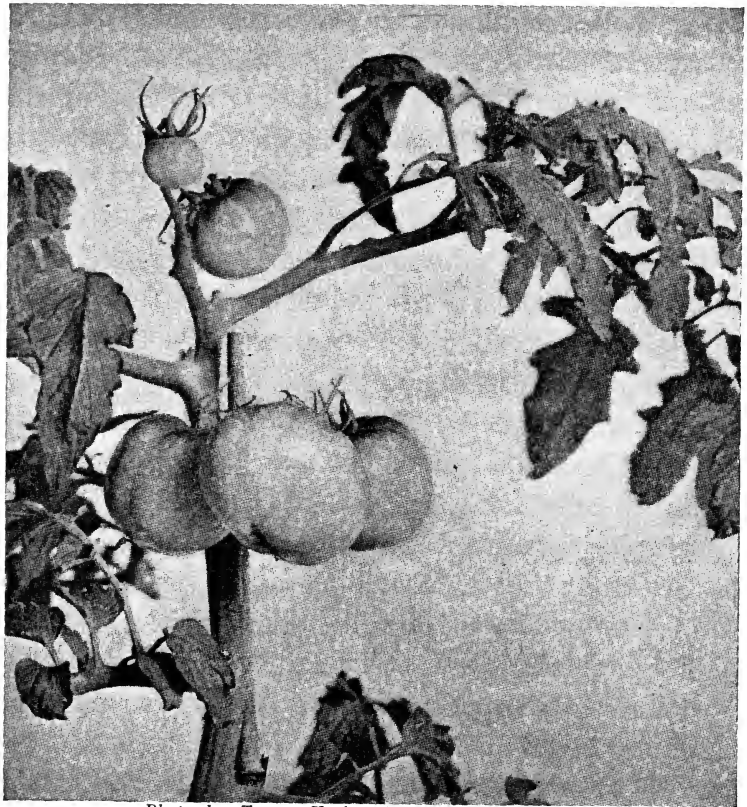


Photo by Tsuruo Kurita, from Modern Photography Annual 1932, published by The Studio Publications, Inc., N. Y. C.

A GOOD SOURCE OF VITAMIN C.

built strong and firm. They need the calcium helper, vitamin D, so that there may be no doubt about the calcium storing in the teeth. And now it looks as if they need every day as much vitamin

C as can be found in two cups of orange juice, or two cups of canned tomatoes. Children not only need to build teeth, but they need to keep them in good condition. Today it looks as if the orange, the lemon, the grapefruit, or the tomato, will help to answer the question, "How?"

III. Vitamin A

Long before the discovery of vitamin D, scientists made tests on white rats and other animals. From these tests they found out many things that have helped us to know what we should do to keep well and strong. One was that some of the fats have in them something that young rats need to make them grow. From those tests, the scientists learned what they thought children need to make them grow.

This is how the discovery came about. A scientist chose twelve rats, all the same age and weight. He kept them in cages of the same kind, in the same room. He divided their food carefully and weighed it. He kept a careful record of what each rat ate. And he weighed each rat each week to see how fast it was growing.

Some of the rats were given milk with their other food. These rats grew much faster than

the rats which did not have milk. They had fine silky coats, and their eyes and noses were pink. That showed that they were healthy.

After 100 days the rats that had no milk stopped growing. Their fur became rough, and lost its silky look. They grew puny looking; their eyes began to show spots on them; and the lining of their noses became pale. They seemed to have colds all the time. The scientist added milk to the other food. Soon the little rats began to grow; their fur again became soft and silky. The spots on their eyes cleared up, and they had no more colds. In a few weeks they were grown up.

Other men tried the same test, only they used butter, or egg yolk or cod-liver oil instead of milk. The tests turned out the same way.

Then the scientists said, "There is something in milk, butter, egg yolk, and cod-liver oil that is needed to make young rats grow, and that helps them to fight off colds." Whatever it was, it looked as if it were needed for life itself. They called it *vitamin A*.

Since that time the scientists have found out many things about vitamin A. Sometimes milk is richer in vitamin A than at other times. What the cow eats seems to make the difference. When

she is fed fresh clover and alfalfa, or clover and alfalfa that have been kept in the silo, the milk has much vitamin A in it.

The food that has vitamin A in it is very good for children. Children who have plenty of food with vitamin A in it grow fast. The linings of their noses and throats are pink and healthy, and they are not so likely to have many colds.

The study of vitamin A has gone on. Men have been able to separate it from the other things in cod-liver oil. It looks like a yellow crystal. Men have also learned how to make a tablet with vitamin A in it. This tablet has many times more vitamin A in it than any food has. However, so long as the foods that are rich in vitamin A are plentiful, we can take care of our growth and help to keep the linings of our noses and throats healthy by eating our share of those foods.

Table of foods rich in vitamin A

liver	chard	green string beans	green outer leaves
eggs	carrots	green peas	of lettuce
milk	sweet potatoes	dandelion greens	green outer leaves
butter	kale	turnip greens	of celery
spinach	yellow corn	parsley	beet greens

Where did you get your vitamin A today?

IV. Vitamins B and G

For hundreds of years the Japanese had been troubled with a disease of the nerves called *beri-beri.* No one seemed to be able to find the cause or a cure. The sailors in the navy seemed to have the disease in more severe form than those who stayed at home. Takaki, the medical director of the navy, set out to find why his men always became ill. He went to Europe and looked over the British navy. None of the British sailors had the disease of which his men were sick and dying. Takaki asked many questions. He wanted to know what the British sailors did, what they ate, how they lived, and many other things.

Takaki learned that the men in the British navy ate many different things, whereas his men ate mainly rice and fish. He learned also that when the British sailors ate grains, they ate the whole grain, and not the hulled and polished grain, such as the Japanese sailors ate. He decided to try an experiment on some of his men.

Takaki sent out two training ships on a nine months' cruise. The men on the first ship were given only the usual food. Of the 276 men on the ship, 169 became sick with the same old disease.

The men on the second ship were given vegetables, meat, and milk in addition to the usual food. Only fourteen of the men became sick, and they had eaten less vegetables and milk than the others.

After that, the diet of the Japanese navy was changed. The sailors were given less rice, more

Paul Parker Photo

MILK CONTAINS VITAMIN B.

wheat and barley, more fish and meat. And every man in the navy had a pint and a half of milk every day. In time the disease that Takaki was fighting almost disappeared.

Soon after this a Dutch scientist found that pigeons fed on polished rice became sick with the same disease that the Japanese had when they lived on the polished rice. Then the scientist fed the pigeons on the polishings that had come off the rice. The birds got well. The scientist said: "There is something in the polishings of the rice which will prevent the disease."

Years later men learned that it was not the hulls of the rice that prevented beri-beri but the rice germ, that is, the baby rice plant. The rice germ was pulled from the grain with the hulls.

This discovery led men to examine the germs of other grains. They found that the wheat germ (the baby wheat plant) also had in it something that would prevent the disease. About this time the scientists named the thing that prevented the disease *vitamin B*. It was the first vitamin discovered, but it was not named until many years after its discovery.

Now we know that vitamin B is in all cereal grains, and that it is in the germ of the grain. That is one reason that whole grain is better food than grain from which the germ and all the hulls have been removed. We know, too, that vitamin B is in milk, tomatoes, and yeast.

In a study of yeast it was discovered that vitamin B is not one thing alone. When the yeast was fed raw to pigeons, it cured and prevented both the disease of the nerves and a disease that caused sores to break out over the body of the pigeons. When the yeast was put in a very hot oven for hours before it was fed to the pigeons, it would cure the disease that made sores on the body, but it would not cure the disease of the nerves. That meant that vitamin B was at least two things. The second thing is now called *vitamin G.*

Study Activities

Does Canning Destroy Vitamins?

If there is a canning factory near your school, visit it to see how the work is done. Find out whether the vegetables and fruits are heated in air-tight vessels. (Green peas, spinach, peaches, and strawberries canned in this way still have vitamin C.) The vitamin C in tomatoes is not hurt by cooking, but when other fruits and vegetables are cooked in the air, the vitamin C is destroyed. Find out what temperature is used and the length of time it takes to do the canning.

Vitamin Table

Foods	Size of Serving	Shares of Vitamins in Each Serving		
		A	B	C
Apple, fresh	1 large	about 1		13
Banana	1 medium	3½	1	17
Butter	1 tablespoon	4½		
Cabbage, shredded, raw	½ cup	about 1	about 1	14
Carrots, raw	½ cup, half-inch cubes	30	about 1	4
Egg, yolk only	1	9	about 1	
Grapefruit, large	½ fruit			106
Lettuce, green outside	3 large leaves	2	less than 1	4
Milk, whole	1 cup	5½	2½	9 (unheated)
Oatmeal, cooked	½ cup		1½	
Orange juice	1 cup	nearly 2	2½	115
Peas, green, fresh	¾ cup	6½	7	53
Potatoes, white	1 medium baked	less than 1		13
Spinach, steamed, chopped	½ cup	46	4	11
Tomatoes, canned	1 cup	13		110
Turnip greens, steamed	½ cup	36	3	

Not all of these foods have been tested for vitamins D and G.

Where Do You Get Your Vitamins?

You should have at least twenty shares of each of the vitamins every day. Nutrition workers

say that children should have many times more than twenty shares of vitamin C for tooth protection. Look at the table on the opposite page, and see for yourself whether you are getting your share.

Plan a Day's Supply of Vitamins

Make an exhibit of a good vitamin supply for one day. Use the table on page 120 to find out how much of each food must be eaten to give enough vitamins for the day. Use glass measuring cups, so that the amounts can be seen through the side of the cup. Show how much of each vitamin comes in each of the three meals of the day. Use real food.

Do You Get Your Vitamins?

Keep a record of your food for a week. Compare your record with the table on p. 115. Did you get all the vitamins you needed? If not, plan your food for next week carefully.

V. Choosing Your Food

From the food that you eat, you need to get enough energy for your body's needs; minerals including calcium, phosphorus and iron; proteins,

and vitamins. Your food should give you these things every day. If you choose a variety of foods from each of the following groups from day to day, you will probably get just about what you need.

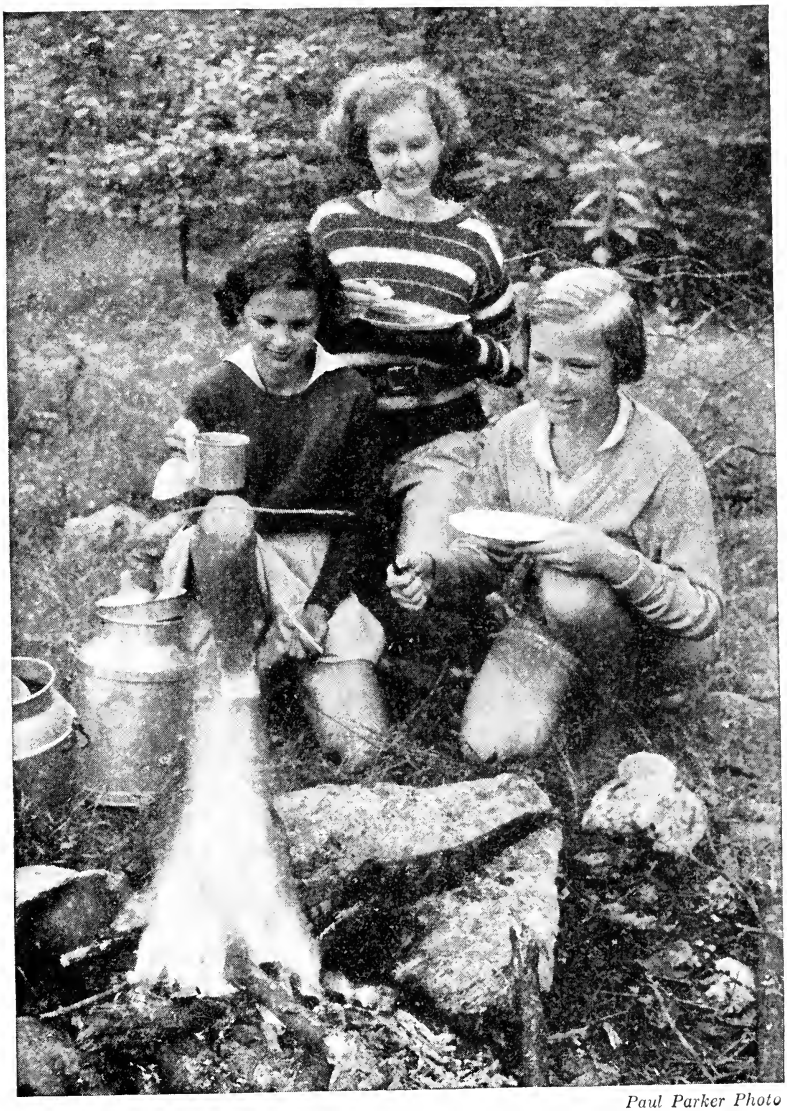
Milk is sometimes called "the most nearly perfect food." It gives us calcium phosphate and some iron, necessary vitamins, and some of the best proteins, as well as a good amount of energy. There is no other food that gives us so nearly everything that we need.

Bread, cereals, and other grain foods are good, inexpensive energy foods. Foods made from the whole grains also give us vitamin B.

Vegetables and fruits give us large amounts of minerals and vitamins. Green leafy vegetables are especially valuable for their iron, and for vitamins A, B and G. Oranges, lemons, grapefruit, raw cabbage, carrots, and tomatoes give large amounts of vitamin C.

Eggs, cheese, nuts, meat, and fish give good proteins. Eggs have vitamin D in the yolk, and also give us good amounts of one mineral; cheese gives another. Can you find what these minerals are?

Fats give the greatest amount of energy, for their weight, of any kind of food, but are usually



Paul Parker Photo

CAN YOU PLAN A GOOD PICNIC MEAL?

eaten in small amounts. Butter and cream contain vitamin A. Cod-liver oil and some other fish oils have both vitamin A and vitamin D.

Sugar gives only energy. You get all you need if you use a little to flavor other foods.

Here is a set of meals for a day which includes food from all the groups: for breakfast—orange juice, farina with milk and sugar, whole-wheat toast and butter, and milk to drink; for luncheon —lettuce and egg salad, whole-wheat bread and butter, molasses cookies and milk to drink; for dinner—meat or fish, mashed potatoes, string beans, lettuce salad, ice cream or custard.

If you know what different foods can do for you, you can buy what you need for less money than if you are just guessing. Canned tomatoes sometimes cost less than oranges, and have about as much vitamin C. Perhaps eggs will be cheaper than meat. You may decide to buy two quarts of milk, and a cheap cut of beef for stew, instead of one quart of milk and an expensive steak.

A wise way of buying food is to spend at least as much for milk as for meat and fish, and to spend at least as much for fruits and vegetables as for meat and fish. About one-fifth of the money for food should usually be spent for bread and cereals.

If you have very little money for food, you will get the best results if you spend still less for meat, and more for milk, whole grain bread and cereals, and fruits and vegetables.

Study Activities

Plan Three Square Meals

Plan a day's food of three meals that give enough iron, calcium, and vitamins. Look over your plan to see that you have proteins (the nitrogen food), and to see that your energy food is economical and also is the best kind. Use the tables on pages 55-56, 66, 81, 95, 111, and 120.

Each one in the class will probably make a different plan. There are many ways of getting the food that you need from the different groups. It is a good thing to eat a variety of foods from day to day whenever you can.

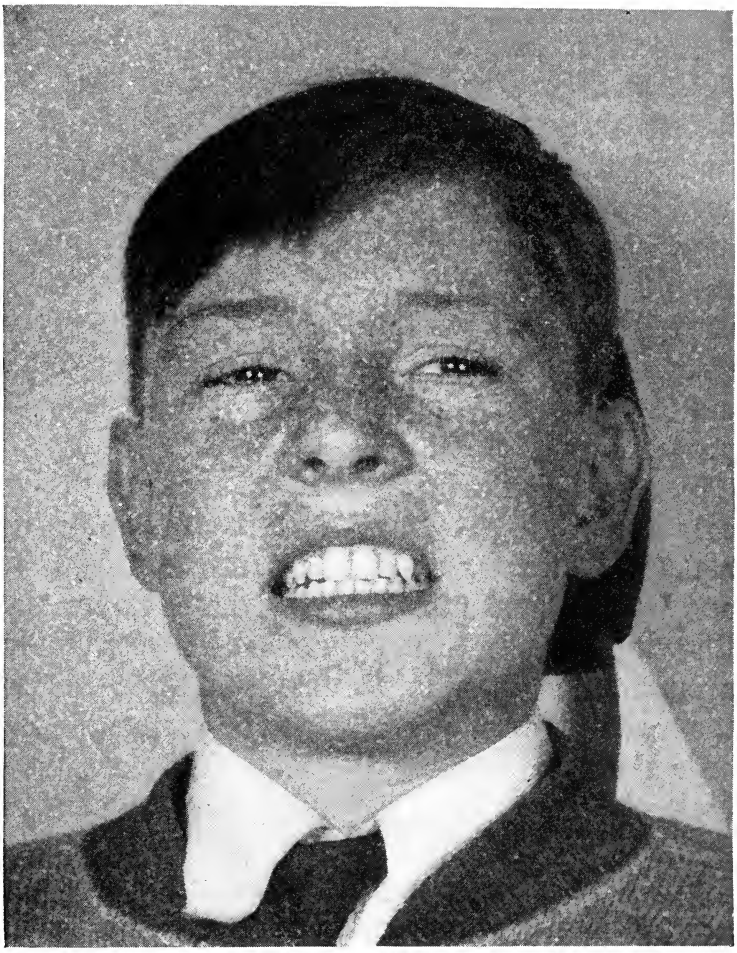
How would your food needs differ in winter and summer? How would your needs differ for a day when you go skating or hiking and for a day when you read and study?

Chapter IX

A PLAN WITH GOOD TEETH IN IT

Thousands of years ago, a boy lived beside a water hole in southern France. His food for the most part was the flesh of the animals that came in the early morning to drink from the water hole. Sometimes he used a sharp stick to spear fish in the near-by stream. Sometimes he ate wild nuts and berries, and the inside green bark of the young growing trees. He did not drink milk, and he had neither a dentist nor a toothbrush. Yet he had strong even teeth. What did he do to grow such strong even teeth?

This boy did not write a history to tell us what he did and what he ate, or what he wore. He and his family, however, had a way of leaving things lying about on the floor of the cave in which they lived—spear points, bones of animals which they had eaten, and the tools with which they worked. Men whose work it is to find how these people of long ago lived, have dug the history of the boy out of the rubbish under the floor of the cave.



THE DENTIST HAS JUST EXAMINED THIS SET OF TEETH AND FOUND THEM IN PERFECT CONDITION.

These men have found skeletons of people who lived at that time. The skeletons had rows of strong even teeth. The teeth were worn down somewhat, probably from chewing on something hard, but otherwise they were as good teeth as anyone could wish for. Chewing hard foods also made the jaws strong and large. There was plenty of room in those jaws for the large teeth to grow straight and even. Jaws that grow crooked teeth are usually too small to allow the teeth to grow in properly.

Today we do not have to chew on bark or partly cooked meat to give our jaws exercise enough to make them grow. Apples, coarse-grain cereals, and hard-toasted bread will do the trick for us. Chewing will also cause the blood to flow faster around the tooth-building cells. The blood carries the tooth-building materials, and as this passes the cells that are building the teeth, the cells help themselves to the tooth-building materials which they need.

The part of the tooth that you see is, of course, not the whole tooth. You do not see the root of the tooth, which extends into the jaw. The white, shiny outer covering of the part that you see is tooth enamel. The enamel does not go beyond the

gum line. A hard cement-like material covers the root of the tooth.

Beneath the enamel and the cement, there is a layer of dentin. The dentin forms most of the tooth. It is softer than enamel, or cement, but is still quite hard. Inside the dentin, there is the soft pulp of the tooth. The nerves and blood vessels of the tooth are in the pulp.

You know that one of the things that the teeth need is calcium phosphate; and you know, too, that today growing girls and boys may get the calcium phosphate they need from a quart of milk a day. We know that the boy of long ago had no milk. How then does it happen that he had strong teeth? We know that he could not get his calcium phosphate from the berries and nuts and bark, because we know that calcium and phosphorus are not in such a partnership in plants.

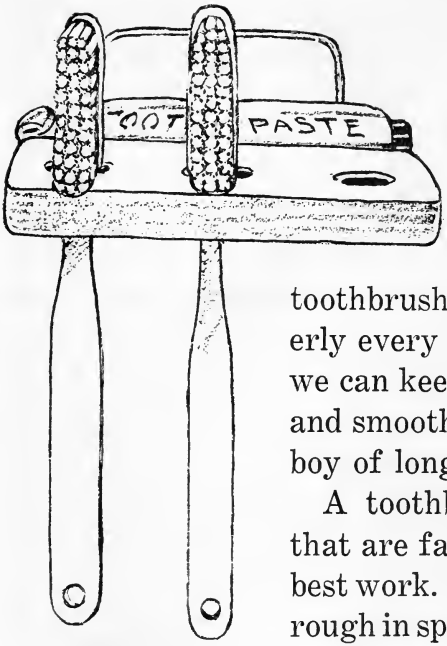
The boy who lived beside the water hole ate much meat. He lived outdoors and was very active all day long. At mealtime he was very hungry. He did not pick out the choice bits of meat as we do and throw away the rest. When he had finished his meal there was nothing left of the animal but its horns and bones. He split the bones to get the marrow that fills the long tube running

through the center of the bone, and then munched the bones. He considered the animal's blood a choice part of the food. In this way he got his calcium phosphate.

In the centuries that followed the time of this boy of long ago, food became much more plentiful. When food was plentiful, people got into the habit of eating only those pieces of meat which they liked. They threw away the rest, but did not know that they should have something to take the place of the values which they threw away. For instance, they threw away the parts of the meat that had the most calcium phosphate in them. For a long time they did not eat anything to take the place of what they threw away.

Today we know that in order to build strong bones and teeth we need foods that give us calcium phosphate, vitamin C, and vitamin D or some other calcium helper. Sunlight is one of the best calcium helpers.

The boy of long ago had no toothbrush. The kind of food he ate kept his teeth clean. If food lodged between his teeth, he probably chewed twigs to get it out. The Indians of our own country keep their teeth clean by eating coarse foods, and by chewing on twigs. Many of the foods that



we eat today, such as custards and cakes, do not keep our teeth clean as coarse foods do. That is why we need the toothbrush. If we use it properly every morning and night, we can keep our teeth as clean and smooth as the teeth of the boy of long ago.

A toothbrush with bristles that are fairly stiff will do the best work. When the teeth get rough in spite of regular brushing, it may be time to go to the dentist for a cleaning. It is a good thing to get a new toothbrush before the bristles of the old one begin to get soft and loose. Of course, each person should have his own toothbrush. If the brush is to be kept clean and fresh, it must be washed well after it is used and hung up in the sun to dry. If there is no sunshine to sweeten the brush, salt sprinkled on it before it is hung up will help to keep it fresh.

A visit to the dentist twice a year helps to take care of the set of teeth that must give service for a good many years. No doubt your dentist will teach you how to use your toothbrush so that the brushing will do the most good. If he does not, you might try the plan on page 133. This plan gets the food from between the teeth, and brushes the food away from the place where the gums and the teeth meet. It also exercises the gums, keeping them pink and healthy. Brushing the teeth once, or better, twice a day makes them look and feel better, and helps to prevent an unpleasant breath.

The three things that you can do that are most likely to keep your teeth from decaying are eating the right food, keeping your teeth clean every day, and going to the dentist once or twice a year. Poor food and lack of cleanliness and dental care probably cause a good deal of tooth decay. These are causes which you can avoid.

When a tooth decays, disease bacteria may sometimes grow in a little pocket, or abscess, at the root of the tooth. These bacteria sometimes make the whole body sick. Decaying teeth may also give you a bad breath.

If you are to have teeth as good as the boy of long ago, you must remember that there are four

teeth in your mouth whose work it is to keep the other teeth in place. They come through before the baby teeth fall out, and before the other teeth in the second set of teeth come through. To find them begin in the middle of the front, and count back on each side to the sixth tooth. That sixth tooth is one of your *six-year molars.* Because they come in before the baby teeth are gone, these six-year molars are often mistaken for baby teeth. But they are not baby teeth. You will get only one set of them. Take good care of them for they keep the other chewing teeth in place so that they can do good work for you.

Study Activities

A Good Plan for Brushing Your Teeth

When brushing the outer and the inner surfaces of the teeth, always begin on the gums, and move the brush over the teeth towards the tips. That means a *down* stroke on the upper teeth, and an *up* stroke on the lower teeth. Why is this done?

Outer Surfaces

Begin by placing the brush between your cheek and gum. The back of the toothbrush should

be towards the tips of your teeth. One side of the bristles should lie against your gum.

Turn the wrist so that the bristles of the brush pass briskly over the gums and teeth. The brush movement should always be towards the tips of the teeth. Replace the brush, and repeat the stroke until the whole outer surface feels smooth and clean to your tongue.

Inner Surfaces

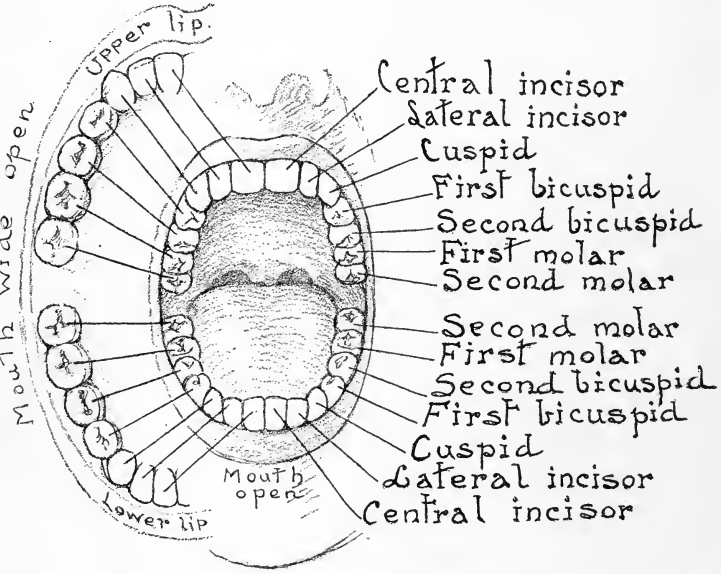
Begin by placing the sides of the bristles against the inside of the gums, with the back of the brush towards the tips of your teeth. Turn the wrist so that the bristles pass with a brisk movement over the gums and the inner surface of the teeth. Remember that the brush movement should be towards the tips of the teeth. Replace the brush and repeat the brushing movement until the inner surfaces are clean and smooth.

Chewing Surfaces

Place the ends of the bristles against the chewing surface of the teeth. Work the bristles around and around, until they loosen any food lodged there. Brush the chewing surface briskly until the teeth are clean.

The Back Teeth

With the tip of the brush, clean the back of the last tooth in each row. Always rinse your mouth thoroughly to wash out any food that may have lodged there.



How Much to Brush

Brush briskly until your teeth feel clean and smooth to your tongue. If you have the dentist clean your teeth once or twice a year, and if you

take good care of your toothbrush, you should be able to get your teeth feeling good to your tongue with eight strokes at each placing of the brush. That would mean forty-eight strokes to clean the outer surfaces of your teeth, and forty-eight strokes to clean the inner surfaces. Your upper teeth will take as many strokes as your lower teeth.

Make a Chart of Your Teeth

Make a chart showing the names and positions of your teeth as they will be if they have all come through the gums.

Make a copy of the chart on a sheet of paper. Use a small hand mirror to examine your teeth. Mark the chart to show which teeth seem to be all right; which teeth need cleaning; which have holes in them; and which have fillings.

Give special attention to the six-year molars.

Take your chart with you when you go to the dentist, and ask him to check it with you. Your dentist will be pleased when he finds that you know the proper names of all of your teeth. Make a new chart for yourself every three or four months. Compare your chart with the one on page 135.

Try These

Can you tell which of these statements are true? Some are untrue. Follow the directions given for the True-False test, page 100.

T F **1.** There is more vitamin A in the green outer leaves of the lettuce than in the white inner leaves.

T F **2.** Vitamin A is the "calcium helper."

T F **3.** Vitamin D is found in cod-liver oil and in egg yolk.

T F **4.** We can make our own vitamin D if we let enough summer sunshine strike our bodies.

T F **5.** Vitamin D helps the calcium to deposit in our bones and teeth.

T F **6.** Oranges, tomatoes, lemons, and grapefruit are very rich in vitamin C.

T F **7.** There is no way to cook vegetables rich in vitamin C without destroying the vitamin.

T F **8.** Oatmeal with milk will give us vitamins A and B.

T F **9.** We need calcium, vitamin D, and vitamin C if we are to build strong teeth and keep them sound.

T F **10.** A glass of orange juice, a cup of green peas, a cup of stewed tomatoes, and a quart of milk will give us our daily supply of vitamins A, B, and C.

T F **11.** We should stay out of the sunshine in the winter time, for we might get cold.

T F **12.** The rays of the sun that help us make vitamin D are too short for us to see.

T F **13.** The wave length of the heat rays of the sun is shorter than those of the light rays.

T F **14.** Long ago, people built strong teeth without drinking milk, so that proves that we do not need to drink it.

T F **15.** The amount of calcium phosphate we need each day for our teeth and bones is found in a pint of milk.

T F **16.** Two visits to the dentist each year should let you know whether you are taking good care of your teeth.

Chapter X

THE BIRTHDAY OF A LAMP

How would you like to do your homework by the light of a candle? That was the best light which the boys and girls had 100 years ago. Then the kerosene lamp came into use. After a while a burner was invented that fed a steady stream of fresh air to the flame, so that it burned with a clear bright light, and the spotless polished glass chimney kept the flame from flickering. The glass chimney had been used earlier to keep the candle flame steady. The kerosene lamp, which combined the burner, the glass chimney, and the use of kerosene was a great improvement over candles.

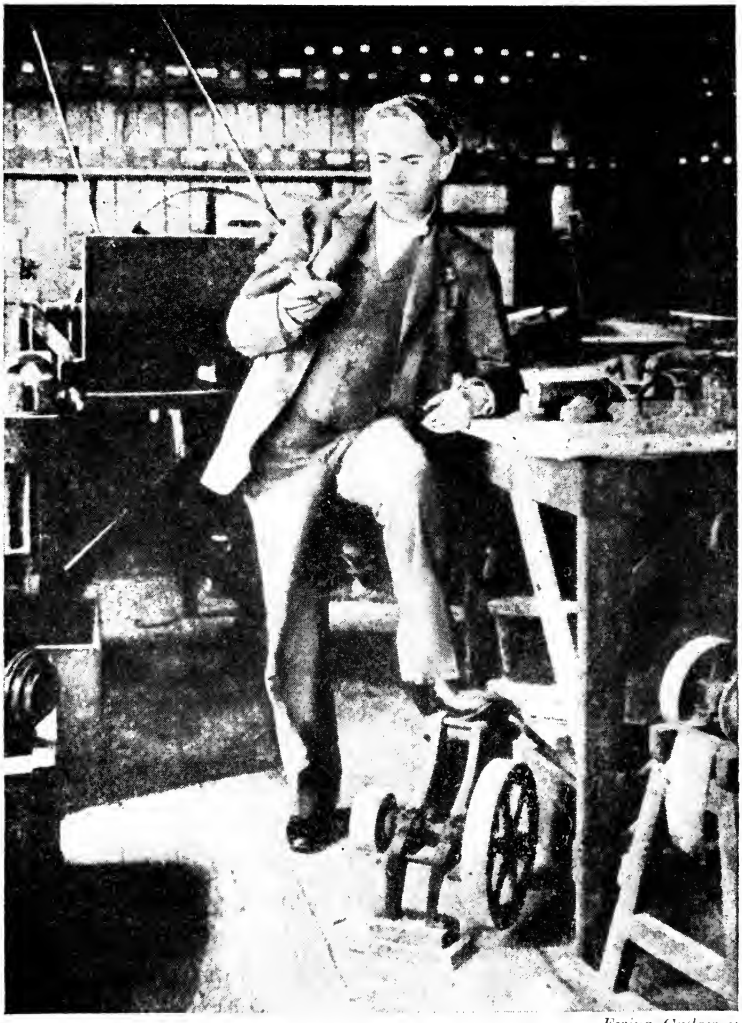
Your grandmother may have studied her spelling by the light of a single candle; certainly, your great-grandmother did. Less than seventy-five years ago, when the English Crown Prince was visiting the United States, the President gave him a great reception at the White House. The Prince stood under one of the great chandeliers ablaze with candles that lighted the huge ballroom. The

candles dripped on his clothes, but his politeness kept him standing where he had been placed just as if he did not know what was happening.

At their best, candles and kerosene lamps were very useful. They have some drawbacks. With the carbon dioxide gas that comes from all burning oils or fats, the lamps and candles give off an odor of burning oil. While only a little comes from a candle or lamp at a time, it will, after a while, make the air unpleasant. Lamps must be cleaned and filled daily, and the chimneys must be washed and polished. A great deal of work has to be done each day, to give a family lamplight enough to work or read at night.

Now there is a kind of light that makes little or no work for the housewife, or the boy or girl who helps her. We push a button, or turn a switch, and get a soft clear light. Furthermore, the light has little heat, and may be turned and shaded so that the eyes may be protected from all glare. All this has come about because Thomas Edison was determined to make a cheap electric light and kept at his task until he succeeded.

Over fifty years ago, Edison was tinkering away in his laboratory in Menlo Park, New Jersey. He was trying out one-piece glass bulbs, testing hand



Ewing Galloway

EDISON AS A YOUNG MAN IN HIS LABORATORY.

pumps, and looking for a cheap burner to use for a light. Edison knew that if he was to make a good lamp that could be sold at a low cost to the user, he needed three things: (1) a cheap burner (a thread or wire that would get white hot when electric current passed through it); (2) a one-piece glass bulb that could be sealed air-tight; and (3) a hand pump that would pump every bit of air out of the bulb.

He decided that carbon was the cheapest burner he could find. However, he found that the carbon burning in the open air did not last long. You may remember why this would be so. The oxygen in the air went into partnership with the carbon, and in a short time the carbon burned out. Edison then tried to burn the carbon in a place from which the air had been pumped, that is, in vacuum. His hand pump was not very successful, for the carbon would not burn longer than ten or fifteen minutes. He improved his hand pump, and about the same time was able to get a one-piece all glass globe that could be sealed air-tight in the making. With his new hand pump, he could get in the new glass globe a vacuum that suited him.

After trying other burners, he went back to carbon, and tried to make a burner out of it. At last,

he was able to make a burner out of a sewing thread on which carbon had been thickly deposited. He bent the sewing thread with its carbon covering into a loop. He sealed this loop into one of his glass globes from which he had pumped all the air. When he put the globe on the electric circuit, it burned with a bright light for forty hours. The incandescent lamp was born. That was in October, 1879.

Other investigators had made important discoveries about electric lighting before this time. Sir Joseph Swan, an Englishman, was one of those who had experimented with electric lamps. Edison succeeded in combining several ideas to make a new thing, an incandescent lamp which could be used everywhere.

In October, 1929, the incandescent lamp had a birthday. All over our country, strings of lights told the story of what the lamp had done. In Michigan, Henry Ford rebuilt a street of the little town where the lamp was made. He even brought the little laboratory from New Jersey, piece by piece, and set it up again. Great men from all corners of the United States traveled to the little town to help celebrate the birthday of the lamp, and to honor the man who made it.

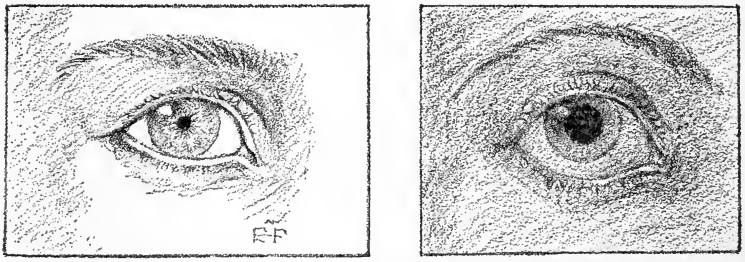
Thanks to Thomas Edison, children can now do their school work by the steady, clear light from an electric bulb. This means shorter work time, less eyestrain, and fewer headaches for those who have studying to do.

The purpose of a lamp is to make it possible for the eyes to work more hours during the day. Is it a good thing for the eyes to do so much work? Is there a way to use them, so that the added hours of work will not harm them? Is it possible to give the eyes too much light? Suppose you try to answer some of these questions for yourself.

Have a classmate stand facing a window, while you look into his eyes. Notice how small the black spot becomes in the middle of his eye. Have him close his eyes. Blindfold him. Use his own clean handkerchief next to his eyes, and cover that with a dark bandage. After he has been blindfolded for two minutes or so, quickly remove the blindfold, and ask him to open his eyes. Notice how large the black spot has grown. Do you know what has happened? The colored part of the eye is a curtain. When the light strikes the eye, the curtain draws itself almost shut, so that only a little light can get into the eye. When the light grows dim, or darkness comes on, the curtain

draws back to let the eye catch every bit of light it can.

This is the way the eye has of protecting itself against too much light, or of getting all the light there is when the light is dim. This curtain can take care of the eye in ordinary changes in brightness and dimness of light. It helps the individual



AT THE LEFT, AN EYE ADJUSTED TO A BRIGHT LIGHT; AT THE RIGHT AN EYE ADJUSTED TO DIM LIGHT.

to keep the eyes from getting tired from too much light or too little light. That does not mean, however, that there is nothing for you to do about it. There is no reason why you should expect that little curtain to do all the work. There is such a thing as choosing a light that is clear but has no glare, and a light that is not dim. There is such a thing as protecting the eyes from strain, by resting them once in a while, and by placing the light so that it does not strike the eyes.

If the lamp is to give you the best service, you have to learn how to use it, so that it will serve your eyes, instead of harming them. Here are a few rules that will help to protect your eyes from eyestrain:

1. Read and work only in a clear light. The eyes can work longer without tiring in such a light.
2. Choose a steady light. It is much less tiring than one that flickers or swings.
3. Work or read in a position in which the light does not shine into the eyes or the face.
4. Lift your eyes from your work once in a while to look off into the distance, for a minute or two. Your eyes welcome such a rest.
5. Hold your work or book so that no shadow falls upon it.
    a. If you have the light fall directly on your work, there is less chance of a shadow.
    b. If you are *right-handed*, sit so that the light strikes your work from over your *left shoulder*, then your right

Paul Parker Photo

IS THIS BOY STUDYING IN A GOOD LIGHT?

hand will not make a shadow on your work.

c. If you are *left-handed*, sit so that the light falls on your work from over your *right shoulder*, then your left hand will not make a shadow upon your work.

6. Tell your doctor, or the school nurse, if your eyes tire easily, if you have headaches, or if the words blur or the lines waver. If you are wise, you will follow the advice you get. It will not only help you now to do what the doctor says, but it may keep you from having permanent eye trouble.

When the doctor tests your vision, he will wish to know how well you can see objects twenty feet or more distant, and whether you are able to read the printed page of your school books easily. He may find that glasses would help you to play a better game of baseball. He may even find that glasses would clear up the blurs that may interfere with your reading, and make it possible for you to read with greater ease and pleasure, and with fewer headaches. The doctor's advice to you will be given that you may find new fields of adventure—adventure in play or in books.

Study Activities

Find the Width of Your Field of Vision

Work in pairs; test each other. The tester should keep a close watch on the one taking the test. Be sure that his gaze is fixed on a point straight ahead; watch his arm position.

To Take the Test

Stand erect. Keep your gaze fixed on a point straight ahead. Stretch out both arms so that they make a straight line through the shoulders. Turn your palms toward the front. Wiggle your fingers. Can you see the wiggling fingers? If so, your *field of vision* covers the half circle lying in front of your arms.

If you cannot see your fingers, slowly move the arms forward from the shoulder; stop when the fingers come into view. In this instance your field of vision covers that part of the circle lying between your arms.

Importance of the Field of Vision

A wide field of vision helps the motorist to avoid accidents at crossroads or when children or

others dash into the street. It helps him to see danger coming from the side.

Any bright light within your field of vision will interfere with clear seeing; it will also tire your eyes. A window may be a bright light.

How to Keep Bright Lights Outside Your Field of Vision

At school, turn your desk or chair at an angle so that the windows are outside your field of vision; be sure not to turn so far that your body throws a shadow on your work. Turn so that the light falls over your shoulder.

If your desk is nailed down, turn your body at an angle so that the light falls over your shoulder.

At home, be sure that your study lamp is placed where you cannot see it when you are working. Place it just beyond your field of vision so that you will get the benefit of its light.

Choose a place to read that allows you plenty of light and yet leaves no lighted lamps within your field of vision.

Plan Your Study Nook at Home

Draw a plan of your study nook at home. Show the positions of your table, your light, your chair.

Is it possible for you to follow the suggested practices for protecting the eyes from strain? What changes are needed to protect your eyes? Ask your mother or father to help you plan the changes needed if you cannot do it alone.

Courtesy of Life's Summer Camps

DARK GOGGLES PROTECT THE EYES FROM THE GLARE OF THE SUN.

Prevent Eyestrain at School

Organize yourselves into a committee, and make a survey of the positions of the desks in your classroom. Is it possible for every child to follow the

practices suggested on pages 146-148? What changes are needed? Ask your teacher to meet with your committee, and help to plan the changes needed.

Study an Electric Light Bulb

Look closely at the electric light bulb in your room. You will see that it contains the things for which Thomas Edison worked:

1. A clear or frosted glass globe that is sealed air-tight.
2. A thread-like loop that glows when the electric current passes through it. That is because the material in the loop resists the electric current, and becomes hot when the current passes through it.

Study the Illustrations

Tell the story which the picture on page 141 suggests to you.

Explain the drawing on page 145.

What are the good points in the picture on page 147?

Why is it a good thing to take a sun bath as the girl is doing in the picture on page 151?

Chapter XI

SUBSTITUTES FOR DOWN

On a cold autumn day, you may have seen a blue heron standing knee deep in chilly water watching for a fish or a frog to come his way. You may have wondered then how the bird could keep warm in such cold weather.

Close to the heron's skin is a soft layer of fine down. Next to the down is a layer of feathers. The feathers on his breast and the under side of his wings have down on them for almost half their length. All the feathers on the heron overlap so that, besides the layer of down, the body of the bird is covered with two layers of feathers. That is how he keeps warm.

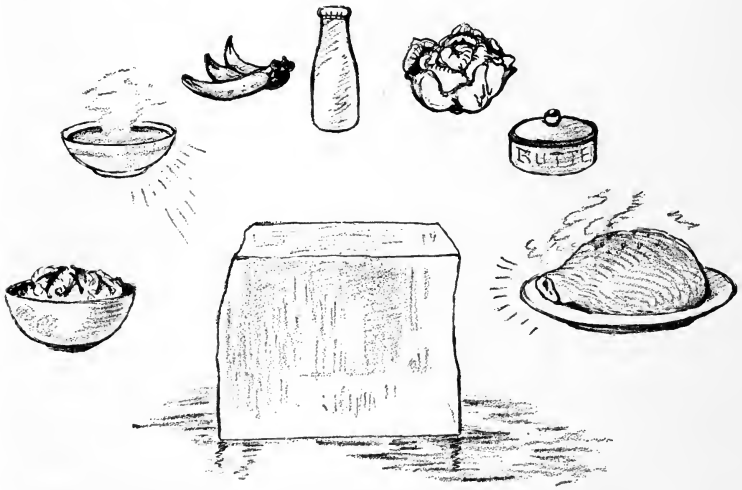
If we could dress in much the same way that the heron does, we should be able to get along with less clothing in winter, and be more comfortable than we now are. Can you guess why? Our clothing problem then is not to keep the cold out. It is not to take up more heat from the air about us. Instead it is to keep the heat of our bodies

FEATHERS AND DOWN KEEP BLUE HERONS WARM.

from running away. The coat of the heron keeps the heat made by its body from running off.

If you think of the way heat behaves, you may understand better the problem of keeping warm in winter. Heat always moves from warmer to

colder places. In the ice box, it moves from the food to the ice. In winter it moves from our bodies to the colder air near by. The colder the air is, the faster the heat flows off. That is one reason for our feeling colder in winter than we do in



ICE AND FOOD. WHICH WAY DOES THE HEAT GO?

summer. Unless we have found some way of preventing the heat from flowing off, it will leave the body very rapidly in the cold outdoor winter weather.

The layer of down next to the heron's skin is soft and loose, and has many air spaces in it. Heat

does not pass through air very readily. As a matter of fact it passes through air more slowly than it does through most other things. The air pockets in the down make the heat move more slowly away from the body of the heron. Above the layer of down the heron has layers of feathers. Between the feathers and the down is another layer of air.

We may dress ourselves as warmly as the heron is dressed, if we learn about woven cloth or textiles, as they are called. Bring to school some small pieces of textiles (silk, cotton, linen, and woolen cloth). Look at each piece carefully through a hand lens, or a reading glass. Can you see that the woolen cloth has many fine fibers? These fine fibers, and the weave of the woolen cloth, furnish many air pockets. These air pockets help the heat to move slowly away from your body, just as did the air pockets in the down of the heron. That is why woolen cloth makes such good winter clothing.

When you look at the cotton, the silk, and the linen, you will see a difference in the size of the fiber, and in the size and number of air spaces in the cloth. Cotton clothing lets the body heat run off quickly.

Courtesy of Adolf Fassbender, F.R.P.S.

WINTER COLD.

There is another reason why woolen clothing is best for winter. Playing or working outdoors in the winter snow often gets the clothing wet. Water acts the same towards heat whether it is in the kettle boiling potatoes or soaked up in your stockings or sweater. Heat passes very rapidly through water. In a very short time enough heat will pass through the water from the fire to the food, to cook the food. Wet woolen sweaters and stockings will not hold the heat from passing off as well as dry ones, but they do their work much better than do wet cotton or silk.

Raincoats, overshoes, and rubber boots are made for wet weather. The rubber keeps the moisture out. It also keeps the air out. For these reasons rubbers and overshoes are good outdoor clothing in wet winter weather, but not so good for wear in the house. The feet should not be shut away from the air any longer than can be helped.

If you choose your winter clothing with a view to keeping the heat from leaving your body, you can find a coat that will keep you as warm as the heron's coat keeps him. Remember, however, that the heron has his coat for outdoor wear. He does not wear his coat in the house. Do you?

Taken on Agfa Plenachrome Film

DRESSED FOR WINTER FUN.

Study Activities

How Rapidly Does Heat Pass Through Different Textiles?

1. What You Need

Some pieces of different textiles, cotton, silk, rayon, woolen. Use pieces of silk, rayon, and cotton large enough to fold so that they will be as thick as the woolen piece.

Some heat—a hot radiator, lamp chimney, electric light bulb, or a warm iron.

A watch with a second hand.

2. What to Do

Double a piece of cotton and put it over the end of one of your forefingers.

Cover the end of your other forefinger with a piece of wool.

At a signal from the one holding the watch, place your two covered fingers on the hot radiator, or iron. When you first feel the heat in one finger, say, "Now." Let someone mark down the number of seconds. Record the time for the other finger. Now change the pieces of cloth so that the woolen piece is on the finger on which the cotton was

before. Try the test again. Repeat the test until the textile that lets the heat through most rapidly on one finger does the same on the other.

3. What the Facts Mean

Which textile carried the heat to your finger most rapidly? Through which did the heat pass most slowly? It was the number of pockets of air that slowed up the heat. Which textile had the most air pockets? Which is best for winter clothing? You might test this out also with a small piece of fur.

4. How You Can Use the Facts

In the selection of winter clothing for outdoor play, which would you expect to keep you warmer, a wool sweater and a coat, or a coat as thick as the sweater and other coat together? Have you learned anything about air that will help you answer correctly?

How can you adjust your clothing to the temperature of the room, so that your body will not become overheated?

Overheating the air close to the body causes the heat to pass from the air to the body. The skin becomes overheated. At once the body tries to

cool itself off by sending the blood flowing faster to the skin, where it gives off moisture in the form of sweat. How does the removal of outdoor clothing and heavy sweaters, in the house, help to prevent overheating?

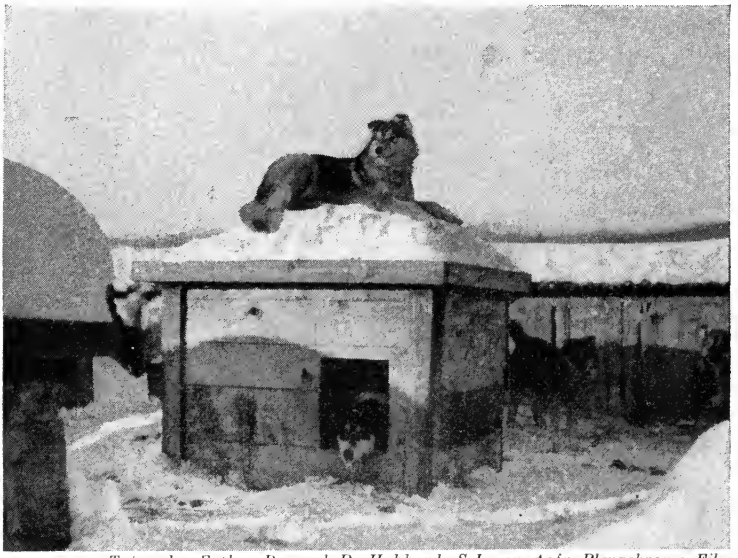
Why Do Girls and Boys Wear Winter Clothes?

Find the map in a geography book that gives the average temperature for January in the United States. The wavy line that crosses the map passes through all places that have the same average temperature for January.

Find the line that passes nearest to your home. What big cities in the country does it pass through? Follow the line to the edge of the map. What number do you find? That number is the average temperature in January for the cities through which the line passes. In what cities would you wear the January clothing you use in your own town?

Here are average temperatures for January in some cities: Los Angeles, 55; Seattle, 40; Chicago, 24; Indianapolis, 28; New York City, 31; Bismark, North Dakota, 8; and Key West, Florida, 70. Is there much difference in the average temperatures for January?

Which of the cities are near large bodies of water? In which would you expect to find the air heavy with moisture? In which would you expect to find the air dry? You have learned how heat passes through water. Would you expect to feel the cold more in Chicago or in Bismark, when the temperature in each is 10 degrees above zero?



Taken by Father Bernard R. Hubbard, S.J., on Agfa Plenachrome Film

HIS COAT KEEPS HIM WARM.

Chapter XII

KEEP COOL!

In the land we call Europe, many things have been found that tell us how boys and girls lived many thousands of years ago. We know that they must have spent their winters in caves, because in the caves of southern Europe we find the bones of the animals which these people ate, the stone fireplaces they used, and the flint spear points with which they hunted.

We know, too, that in the summer time these people must have wandered about in search of food. Bones of animals, spear points, and stone fireplaces near water holes tell us the story.

On the walls of the cave are pictures made by people living thousands of years ago. These pictures show that every one wore only a single garment, the skin of an animal.

For the boy who lived beside the water hole, the question of keeping cool in summer was a simple one. His single garment only partly covered his body. His legs, arms, and shoulders were bare.

The air, striking his bare skin, carried away the heat that came from his body. Then, too, he probably ran about a great deal so that he sweated freely. The sweat gathered on his warm skin; the

Courtesy Life's Summer Camps

DRESSED TO KEEP COOL.

warm air caused the sweat to evaporate; and it passed off into the air in the form of vapor, carrying the heat with it. Then his skin felt cool and refreshed.

You know that heat passes from things that are warm into things that are cooler. That is

why the cool moving air striking the boy's body carried off the heat. When water changes to vapor and rises, it also carries off heat. That is why the boy became cooler when he sweated freely.

Can we use this knowledge to help us to keep cool on a hot August day when the thermometer registers 90 degrees in the shade? We must remember that the summer-time problem is to help the body heat to run off faster. How can that be done?

Few clothes and loose clothing will allow the moving air to strike the skin and carry off the heat. The materials from which clothing is made have something to do also with keeping the body cool. Wool, with its many air spaces, prevents the heat from passing off at a rapid rate. Therefore it is easy to see why linen and cotton are the popular materials for clothing in hot climates.

The color of clothing also has much to do with its coolness. White and light colors reflect the rays of the sun. Black and dark colors absorb them. Therefore light colors are cooler than dark ones. Try putting a piece of white cloth and one of black cloth on the snow, when the sun is shining. The day should be cold, but not bitterly cold.

Where does the snow melt more quickly? If there is no snow, try putting the pieces of cloth on a cake of ice.

In hot climates, natives always wear light-colored clothing. Northern people living in hot

Courtesy Life's Summer Camps

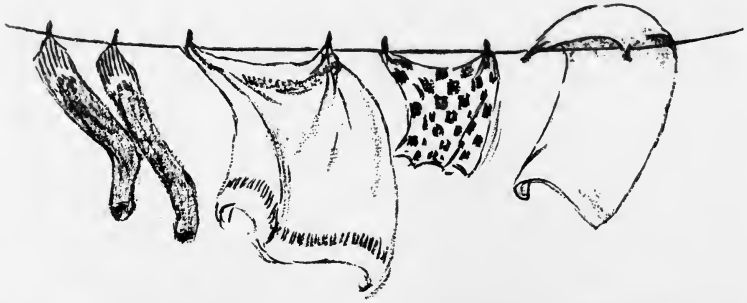
LIGHT-COLORED CLOTHES ARE GOOD FOR HOT WEATHER.

climates do not always wear white, as the glare of the sun hurts their eyes. However, they do wear light-colored clothes all the time. These colors help to keep the air cool that lies close to the body. Then the body heat passes off more easily.

If we choose our summer clothing with these things in mind, we will choose white or some light color. Our clothes will be of cotton or of linen,

and of light-weight, finely-woven cloth. They will be of wash materials so that they can be kept clean easily. These summer clothes will be loosely made so the air can move freely over our bodies, and carry off the sweat and heat.

If we wish to keep cool, we can also use the facts about water carrying off heat. The more water we drink in summer, the more freely we sweat. Most of us need at least from four to six glasses of water a day and often more. Proper summer clothes will allow the sweat to evaporate rapidly. Then it will pass off as vapor, and carry away much of the heat that is making us uncomfortable.



CLOTHES DRY QUICKLY WHEN THERE IS A BREEZE TO CARRY OFF THE MOISTURE.

Did you ever notice how long it takes the washing to dry on a damp day in summer? That is because there is so much moisture in the air that

the moisture in the clothes has no place to go. It stays in the clothes unless a breeze springs up and carries off some of the moisture. On a hot damp day in summer, the sweat stays on your hands and face because it, too, has no place to go. When the sweat stays on the skin, it holds the heat there, too. That is why we feel so uncomfortable on such days. We keep moving about to find a little breeze. The slightest breeze is welcome, for it carries off the heat in the evaporated sweat.

We must use common sense, of course, in the matter of cooling off. If the body cools too rapidly, it is likely to be chilled. Being chilled is far worse than being too warm, as anyone who has had a summer cold can tell you. When we have been exercising hard, and are sweating a great deal, light, loosely-woven material is good because it absorbs the moisture.

It is worth-while to remember that keeping clean helps us to keep cool. A bath washes off the waste left on the skin by the evaporation of sweat. When this waste is washed off, the skin is better able to allow the heat to pass off quickly. Clean clothes are cooler, too, than dirty ones; they seem to allow the moving air to pass through them better.

Fortunately fresh fruits and green vegetables are plentiful in hot weather. They are very good hot-weather foods. They are refreshing and they furnish us all the energy foods that we need as well as vitamins and minerals. Fresh fruits also help to keep the food canal free from waste. In this way they help to keep us feeling fit during the hot summer months. When we are feeling fine, we do not mind the heat so much.

You have learned that when food is digested, part of it is changed into liquid form and goes through the walls of the intestine into the blood or lymph. There are two parts to the intestinal tract, the small intestine and the large intestine. The food passes from the stomach into the small intestine, where the digested food in liquid form passes through the walls. The remainder passes into the large intestine. Here most of the water is absorbed through the wall and what is left is rather coarse, solid material which the body cannot use for food.

The natural movements of the muscles of the intestine keep the food moving along. If everything goes as it should, the waste materials will be regularly removed from the large intestine in a bowel movement every day.

Drinking plenty of water and eating fruits and vegetables and whole grain cereals and bread help the muscles of the intestines to act naturally. When they do not act naturally, and the waste materials are not removed, the condition is called constipation. Constipation may cause headaches, or may make you feel tired or sick in other ways. Regular bowel movements help you to keep fit.

In the summer, we seem more thirsty than in other seasons. When you think of all the moisture that passes out of your body in sweat on a hot summer day, it is easy to see why you need to drink so much water. The cool water we drink goes on its way through the body in the blood, picking up heat as it goes. In the blood it flows into the skin and from the skin passes off in the form of sweat, carrying the heat with it.

We need plenty of clear cool water. There is little danger of drinking too much. A little fruit juice in the water is often very refreshing, especially if no sugar is added to it. This is because sugar makes heat.

Clothing selected for its coolness, fruits and vegetables for their freshness and coolness, water for bathing, and water for drinking, all make the summer a happier and cooler time. There is one

other thing that is needed, if you are to stay cool and comfortable in hot weather. It is this: keep your temper. Don't let yourself get all flushed and hot in anger. Cheerfulness and good nature

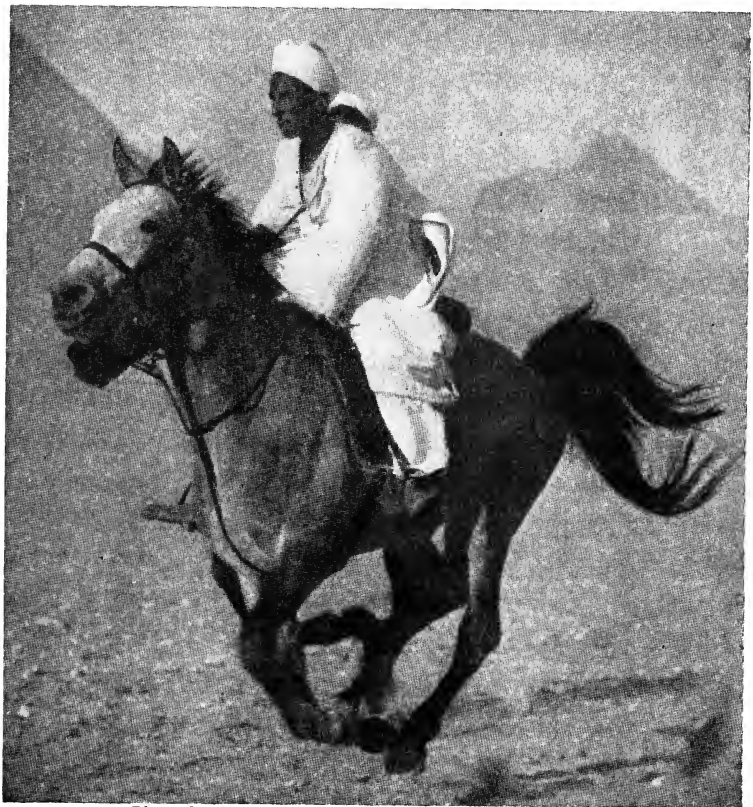


Photo by Martin Munkácsi, from Modern Photography Annual 1933-4, published by The Studio Publications, Inc., N. Y. C.

ARABS DRESSED IN LOOSE, WHITE CLOTHING.

are much cooler and pleasanter. There is enough heat all about you in the hot summer weather without that which you manufacture in your anger. There is an art in keeping cool. Learn it. Practice it. Keep your temper. Try laughing things off. Keep cool.

Study Activities

Plan a Hot Weather Wardrobe

If you have a weather-man in your town, get from him the temperature record for the past year. How many days had a temperature that made it necessary to dress so that the heat would run off rapidly? What kind of clothing did you need for those days? How many outfits did you need to keep cool and clean for the hot days?

Plan hot-weather clothing for yourself. Choose fabrics that let the heat pass off quickly, and that wash easily and well. Be economical.

Plan Some Fun for Hot Weather

Select games that will give you fun, but will leave you feeling comfortable. Why are games that make you sweat a little, good summer games? Why are vigorous games not the best for hot days?

Chapter XIII

OUR ENEMY THE COLD

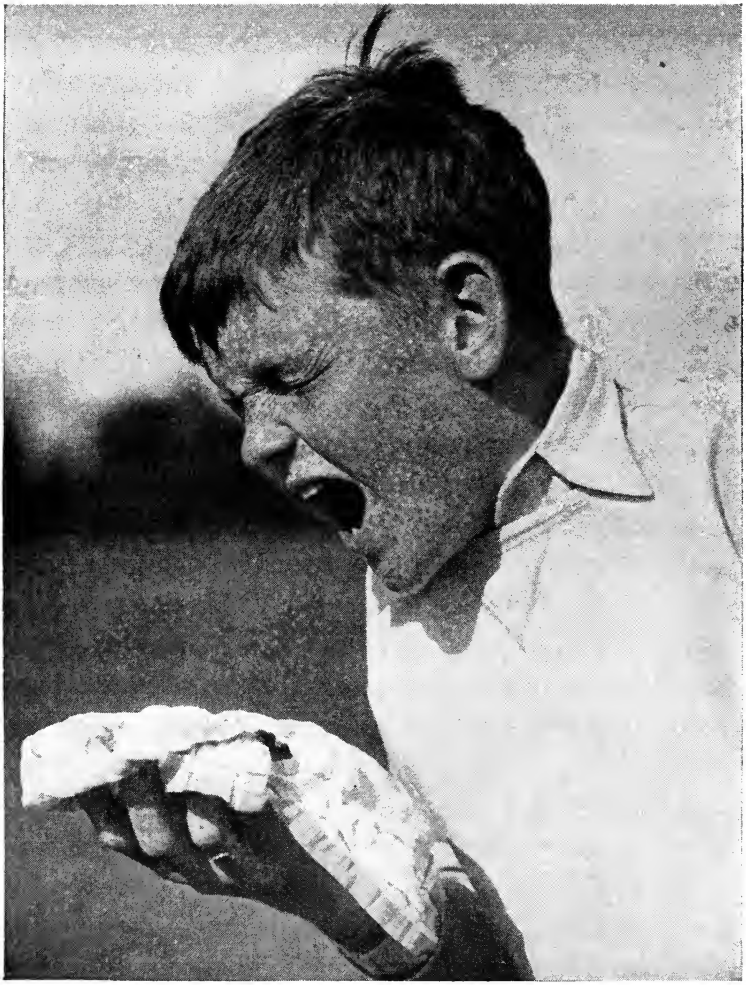
John had the pink eye on the day he failed to come with his new baseball for the game you had planned weeks ahead. Of course no one wants pink eye that hurts you and makes you stay indoors when you want to play. But John could not come without bringing the pink eye with him. So John and his pink eye stayed home. The ball stayed home, too, and the game was spoiled.

Mary had a cold, and could not go on the trip to the pond. For weeks you had planned that trip for tadpoles for the aquarium. Mary was the only one in the class who owned a dip net. There was not time enough to make another net. The trip had to be put off until another time.

John's pink eye and Mary's cold spoiled your plans. It is better to have your plans spoiled than to give your cold to your friends. Very often absences from school spoil the plans that teachers and pupils make for work or play. Plans must be changed, and some good times missed, but that is

not the worst of it. Many of the absences are caused by illness, just as in the case of John and Mary. Measles, whooping cough, diphtheria, scarlet fever, and even the common cold, are not merely nuisances, and disagreeable, but they are dangerous as well. Furthermore, they have a way of spreading among the children in school.

The common cold seems to be the worst offender of all. Just let an unexpected sneeze or cough or snuffle break in on the stillness of the study hour on an afternoon. Before two days, others of the class may be coughing or sneezing or snuffling. Whenever a person coughs, sneezes or spits, germs that are in his mouth, nose, or throat may be carried out in the spray. Those who are near the person who coughs or sneezes, or even several feet away, may breathe in the germs unless the cough or sneeze is covered by a handkerchief. Wherever the spray falls, the germs may live for a while. They may live long enough to be picked up on some other person's fingers and carried in this way to the mouth or nose. At certain times during the year the common cold keeps getting in the way of all the good times of the girls and boys in school. Would it not be a fine thing to *expel* the cold from school?



Ewing Galloway

READY TO COVER A SNEEZE.

There would be fewer colds if the girls and boys together with their teachers and their parents made up their minds to work on the task, and if they kept at work until the cold was *out*. Here is the way one group of girls and boys in a southern state, with the help of their teacher and parents, tried to expel the cold.

One committee went to the principal's office and found out how many children had been absent from school the winter before. They learned that most of the absences had been caused by colds. Then they talked the matter over with the principal and the school nurse.

At the next meeting of the class, they made their report, and asked that a committee be sent to the school nurse, and one to the Health Officer at the Board of Health to find out how to keep down the number of colds in their school. They also appointed a committee to go to the library to read about prevention of colds.

The library committee reported that a study had been made which showed that girls and boys who worked in classrooms where the temperature did not rise above 68 degrees had fewer colds than those who worked in warmer rooms. The boys and girls in cooler rooms also were able to study

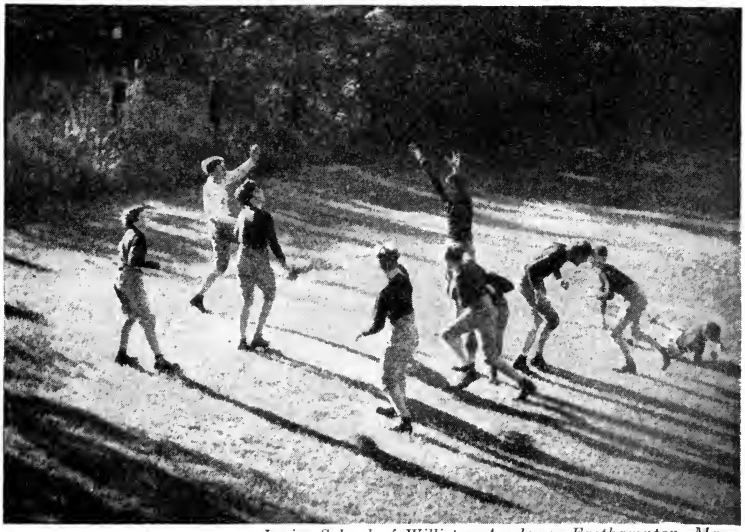
better than the others. The report of the study said that the temperatures of indoor rooms in winter should usually be kept between 65 and 70 degrees, averaging around 68. Older people and very young children may need warmer temperatures.

Other studies showed that overheating of rooms is a common cause of discomfort, and that overheated air makes it easier for one to catch pneumonia and other diseases as well as colds. Air should be clean and moist as well as cool, and we are more comfortable if it is constantly changing and moving without a draft. In a still atmosphere, the body is surrounded by a layer of air which becomes hot and moist from the heat and moisture given off by the body.

The library committee found out that air will not move through a room unless there are two openings, one through which the air may enter, and one through which it may leave. Windows should be open both at the top and bottom. The cooler air outside then comes in at the bottom, and the stale, warmer air goes out at the top.

The committee also found a book which said that plenty of active, outdoor play each day seemed to help boys and girls to keep from catching cold.

One advantage of keeping a cool temperature in the rooms where you work or read in winter is that after a while you will get used to low temperatures and will come to like cooler rooms. As



Junior School of Williston Academy, Easthampton, Mass.

PLENTY OF OUTDOOR PLAY HELPS TO PREVENT COLDS.

a result, your body will get used to lower temperatures and you will not mind the winter weather very much when you go outdoors. In fact, you may come to like the crisp air and the biting cold better than you like warmer weather.

The committee that called upon the nurse gave the following report: A person is less likely to take cold if he has the habit of taking off his rubbers and sweater when he comes indoors. Drinking plenty of water each day, sometimes as much as six glasses, is one way to ward off colds. Keeping the bowels clear by getting rid of all food waste each day is one of the best ways of keeping free from colds. And it is important to make sure that you have enough vitamin A each day to keep the lining of your nose and throat healthy. No lips or fingers should ever touch that part of the drinking fountain over which the water flows.

The committee which visited the Board of Health came back with some pictures and some colored glass dishes filled with something that looked like brown jelly. One dish showed what happened when a boy with a cold coughed into the dish. The doctor at the Board of Health said that the spots showing in the dish were families or colonies of germs that had been in the nose and throat of the boy with the cold.

The doctor had lent the children two other dishes. In one, the boy with the cold had rubbed his fingers carefully on the jelly after they had been thoroughly washed in hot soapy water.

There was nothing growing on the jelly in that dish. In the other dish the same boy had rubbed his fingers after he had coughed on them. Some of the colonies growing on the jelly in that dish looked like those in the dish he had coughed into. The doctor said that the boy had coughed some of the germs into his hand and then rubbed them off into the dish.

The doctor had told them something else, too. One of the best ways to keep colds from spreading is for the person who has a cold to stay by himself, away from other people. When someone in the family has a disease like measles, or scarlet fever, the law requires that person and often every one else in the family to stay home. The law also says that there shall be no visitors at that house. This is called quarantine, and its purpose is to keep the disease from spreading to other people.

The law does not require the person with a cold to be quarantined. But the thoughtful person will see the reason for staying home when he has a cold.

The pictures which the committee brought from the Board of Health showed how to keep from giving your cold to other people, and each picture had a rule. The rules were:

1. Stay away from other people when you have a cold. Keep it to yourself. Do not sleep with anyone else.
2. Cough and sneeze into your handkerchief. Use a paper handkerchief and burn it after you have used it.
3. Wash your hands before you handle anything belonging to anyone else. Boil your dishes before you let anyone else use them. Do not let anyone else eat food that you have handled.

The girls and boys knew most of these things before, but they had not given them much thought. They planned to use the pictures and rules in expelling the cold from school.

After the reports were given, the girls and boys with the advice of the principal and their teacher made plans to prevent colds in their school. This is what they did:

Committee A kept watch on the temperature of the room. They recorded the temperature each hour of the day. They gave the reports to the janitor and worked with him to keep the temperature at about 68 degrees. They did this by adjusting the windows.

Committee B saw that every one removed rubbers and sweaters before school opened each session.

Committee C kept a record of how children used the drinking fountain. Their report showed the need of making a plan for girls and boys to use the drinking fountain properly. They made such a plan with their teacher, and offered it to the other classes in the school.

Committee D said, "We must learn to cover our coughs and sneezes quickly." They made a plan and had much fun over it all, but kept at it until not a cough went uncovered.

Committee E called themselves the Reminder Committee. They made a chart showing the vitamin A foods, and plans for getting plenty of vitamin A each day. They made other reminders, such as: "How much outdoor play are you going to get today? Did you get your share of sunshine yesterday? Where are you getting your vitamin A today?"

Committee F worked on two- and three-minute talks to give in other rooms so that all the children would know what they were trying to do. They tried to get all the children in the school to help keep the common cold out of that school.

There were few colds in that school all year. The work done by the girls and boys helped to keep the children free from colds.

Plan to Expel the Cold

Study the absences in your school. Find out whether the cold is an enemy of the good times of the girls and boys in your school.

Work out a plan for the prevention of colds in your school. There should be enough to do so that several committees could be kept busy. Each committee should write up its own report. Perhaps you may be able to work out some new plan for preventing colds.

Test on Handkerchief

Does boiling the handkerchief and drying it in the sun make any difference?

What to Do

Cough into your handkerchief. Put the handkerchief over your finger with the side turned out that you coughed on. Rub that part of the handkerchief over a potato that you have prepared according to directions on pages 8-14. Label that dish "Dirty handkerchief."

GOOD TIMES OF DAY FOR WASHING THE HANDS.

Wash your handkerchief thoroughly in hot suds, and boil it in soapy water for ten or fifteen minutes. Dry it out in the sunshine. Then try the handkerchief again on another potato. Be sure that your hands are clean, and that you do not let anything else get onto the potato. Label the dish "Boiled handkerchief." Set both dishes away for a day or so in a warm place. Then bring them out to see what difference it made to wash and boil the handkerchief.

What the Facts Mean

Boiling the handkerchief killed all the bacteria on it. The handkerchief was sterile when you took it out of the boiling water. Drying it in the sunshine made it pretty sure that any bacteria blown against the handkerchief in the dust would be killed by the sunshine. One way to stop the spread of colds from one person to another is to sterilize or burn the handkerchiefs used by the person with the cold.

Try These on Yourself and Your Friends

See page 40 to find out how to take this test if you do not remember how to do it. When you have finished the test, find the sentences that will

show you whether you marked the statements correctly.

1. When your eyes tire easily, or the words blur on the page
   (a) you should stay home from school altogether.
   (b) you should go to the school nurse or to your doctor and get advice.
   (c) you should wash your eyes with cold water.
2. The best way to hold or place your work so that your eyes will not tire easily is to
   (a) keep the work so that a clear light falls on it without shadow.
   (b) sit so that the light is in front of you.
   (c) have two lights, one on each side.
3. Woolen clothing is warmer than cotton, because
   (a) it comes from sheep.
   (b) it has many little air spaces in it.
   (c) it is heavier than cotton.
4. Our problem in keeping warm in winter is to
   (a) keep the body heat from running away.
   (b) find rooms that are warm enough.
   (c) find clothing that will let the heat of the rooms reach our bodies.

5. The hardest part of keeping cool in summer is in
   (a) staying out of the sunshine.
   (b) helping the body heat to run off quickly.
   (c) finding air coolers for our homes.
6. Here is a law of heat movement that we can use to keep cool in summer:
   (a) Heat passes from that which is warm to that which is cool.
   (b) Heat stands still, but cold moves to that which is warm.
   (c) Heat moves from that which is warm to that which is warmer.
7. One of the best ways to avoid catching cold is to
   (a) gargle your throat each night.
   (b) visit the doctor every week.
   (c) stay away from people who have colds.
8. A study of colds among school children shows that children have fewer colds in schools where
   (a) the classroom is kept about 68 degrees.
   (b) the rooms are kept warm and cozy.
   (c) the rooms are kept cold.

Picture Study

Look carefully at the picture on page 185. What hand-washing rules will help to prevent colds?

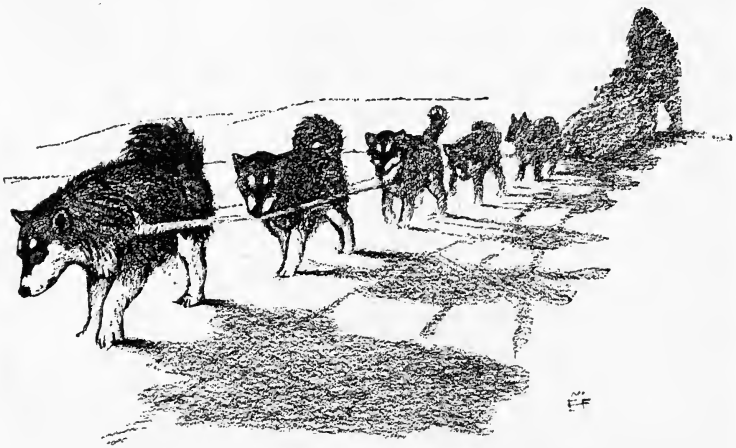
Chapter XIV

FIT FOR A GREAT ADVENTURE

It was Thanksgiving Day in Little America—a white Thanksgiving Day, and bitter cold. Yet it was midsummer down at the bottom of the world where Little America snuggles among icebergs and snowdrifts. But the men were gay, and they sang and joked as they went about their work. The sun was shining and the sky was clear. Better still, there was a promise of clear weather and sunshine for hours. That was why the men were gay. They needed clear weather for the task that lay before them.

The great moment of the Byrd Expedition was at hand. For months, Byrd and his men had been busy getting ready for this very day. The time had come for the flight over the South Pole. Amundsen, the great explorer, had made the journey to the Pole and back; a long dreary journey of 1,700 miles through snow and ice and bitter wind. He was gone from camp eighty-seven days and made the whole trip by dog sledges.

Byrd hoped to fly over the Pole and back again in less than twenty-four hours. If everything went right, he could do it. He knew that the long summer day of the polar land was in his favor. If he ran into no storm or fog, he would have sun-



TRAVELING BY DOG SLED IN POLAR REGIONS.

shine all the time. But he knew that he must be ready for storms. He knew also, that he must be ready for accidents and forced landings.

The great airplane lay in its cradle of snow. Into it the men packed the stores: 800 pounds of food, medicine, camp supplies, and sledges to be used if the plane had to land. They took instruments to get the bearings of the plane, so that the

men might know where they were at any time. They also had a radio to send messages back to camp. Every thing that went into the plane was weighed. It had taken a long time to decide just what could be taken. The men knew that they must travel light, for there were high mountains between the camp and the Pole. High mountains meant that other things in the plane must give way to fuel. It was even more precious than food.

Byrd and the three men who were to go with him wore their big sealskin oversize boots, or *mukluks*. In the boots they wore reindeer socks with the fur turned inside, three pairs of heavy woolen socks, and a pair of silk socks next to their skin. Over their woolen inside garments they wore suits of reindeer skin with close-fitting hoods. These suits are lighter and warmer than any other clothing. Suits made from wind-proof cloth were pulled on over the reindeer suits. Their sealskin mittens were large enough so that the men could wear woolen mittens inside. They took with them queer looking masks to protect their faces from the cold.

Byrd and the three men tucked themselves into the plane. The engine sputtered, and then sang as it warmed up. The men in the plane waved good-

bye to their comrades in the snow. The commander gave the signal, and the men outside put

RICHARD BYRD'S PLANE.

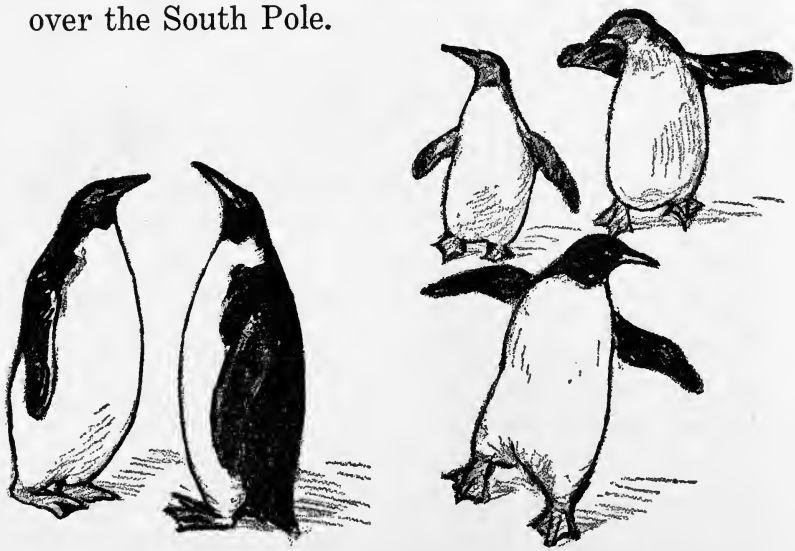
their shoulders against the plane, and it moved slowly down the runway. The propeller threw a swirl of snow into the air, blinding the men who

ran alongside. They were off. The plane rose, circled above the camp, and headed toward the south. The men at the camp stood watching it until it was lost to sight in the dazzling whiteness of the Antarctic day.

It was the middle of the afternoon when the plane left Little America and went sailing off through the sunshine. In America it was night. For eight hours the plane sped towards the south. Sometimes it had to slow down. It was hard to tell, at times, whether the plane was headed into clear space or was nearing a glacier. At one time the plane had to rise so high to clear a mountain of ice, that the men were forced to throw overboard 200 pounds of food to lighten the load.

Shortly after midnight, the instruments showed that the plane was nearing the Pole. The land was high and flat, and covered with ice and snow. There was not a sign of life anywhere, nothing but a dreary white waste sparkling in the sunshine. Commander Byrd sent a radio message. The message read: "We have reached the vicinity of the South Pole, flying high for a survey. We can see an almost limitless polar plateau." All over America, people tuned in on their radios to get this message broadcast from New York.

After a survey and some map making and picture taking, the plane headed for Little America again. It reached camp at ten minutes past ten o'clock in the morning. It had been away just about nineteen hours. In that time, it had traveled about 1,600 miles, and had covered the same territory over which Amundsen had driven his dogs for eighty-seven days. The great adventure of the expedition was history. Byrd had flown over the South Pole.



PENGUINS, THE ONLY NEIGHBORS OF THE MEN IN LITTLE AMERICA.

When Byrd began to choose his men for the expedition, back in 1927, he knew that the success of the expedition depended upon the kind of men who went with him. He knew what kind of men he wanted, and he went about looking for them.

Any man who joined his party must be ready at all times to carry an extra burden of work, to endure cold and hardship, and to get along with little food when food was scarce. To do this a man must have a strong body. He must be equal to any strain put upon him. His nerves and muscles must be ready to serve him whenever there was a call for quick action or for a long haul. And the man must be able to stick to a task through trying times.

Commander Byrd believed that a man who practiced good habits of eating would stand up under a strain better than those who did not have such habits. He did not want a man who ate too much, or one who ate too little. There was no place in his party for the man who always needed alcohol or coffee or tobacco; nor was there any place for the man who used too much sugar, or the man who failed to select his food wisely.

Commander Byrd did not want anyone in his party who had to depend upon stimulants. A

stimulant is something that spurs one on to work faster or harder so long as the effects of the stimulant last. The drug caffein, in tea and coffee, is a stimulant. One of the bad things about stimulants is this: the more a person uses them the more that person seems to need them, and the less able he is to work without them. The scientists now believe that the use of stimulants is very much like whipping up horses to make them go faster. If the whipping is kept up for a long time the horses get tired and slow down unless they are again whipped. These scientists say that it looks as if the use of stimulants at last tires out the nerves. There was no place in Commander Byrd's party for men with tired-out nerves. Such men would not stand up well under hard work, long hours, and difficult conditions.

Byrd did not want men in his party who depended upon alcohol to steady their nerves. That was because alcohol is a narcotic. Narcotics are given to sick people to soothe the nerves or to deaden pain. Doctors use narcotics with sick people when it seems best to do so; but they use the drugs very carefully because narcotics create an appetite for themselves. The more one uses them, the more he thinks that he needs them. Alcohol

works more slowly than other narcotics, but it is a narcotic nevertheless. Certainly, no man who needed alcohol to quiet his nerves would be a worth-while member of the expedition that needed men with steady nerves and clear heads—men who could always be depended upon to do their best.

Commander Byrd chose men of courage, and men with the determination to stick to their tasks no matter what might happen. He wanted men with the kind of courage and determination shown by Captain Scott's men in 1912. These men found the South Pole and were on their way back to camp. The march was over high, wind-swept plains covered with snow and ice. The weather was very cold, forty-five degrees below zero. The men lost their way and wandered on, day after day, trying to find the camp. They had little food left, no shelter save a small tent, and they were sick with cold and hunger. There was little chance that they would reach the camp, and little chance that other explorers would find them before the end came. Yet the men kept a written record of their discovery, and of their march, day by day. And day by day they marched forward until they had no more strength to march. Then they set up the little tent, wrote the last page of the record

of their march, and lay down to sleep. There they were found months later, just as if they had settled down for a night's rest. That was the brand of courage that Byrd wanted in his men, and that was the kind of men he chose.

Of course it is not only men who go to the South Pole who need courage, determination, cheerfulness, and the will to work together. The men who went with Byrd were not born with courage. Courage, determination, cheerfulness, and willingness to work with others are habits. Each person has to build these habits just as other habits are built. There are many times each day that each one of us has to meet little discomforts, trials, and duties. Courage is built by meeting these in the right way.

Are you afraid of the dark? There are two ways to get over your fear. One is to go into dark places often enough to prove to yourself that there is nothing there to fear. The other way is to learn to like worth-while things that can be studied only in the dark. This is perhaps the better way. Who ever heard of anyone's learning to know the stars in broad daylight? Who ever caught a Luna moth or learned its ways when the sun was shining? How could Columbus ever have learned to

Photo from Wide World: © Byrd Antarctic Expedition
THESE TWO MEMBERS OF BYRD'S EXPEDITION ARE SHOWING COURAGE AND RESOURCEFULNESS.

steer his vessel on his voyage into the west, four and a half centuries ago, if he had not stood long hours under the open sky at night? How do you suppose Lindbergh came to like flying at night? The habit of courage is built by meeting in the right way those things that call for courage.

There is a kind of examination which will help you to find out whether you are fit for worth-while

adventures. That is the health examination which the doctor gives you. From his examination, he can tell you whether you are in good condition, and if not, what you can do to improve.

When the doctor examines you, he wants to know whether you are growing as you should. He may measure your height and weight, and compare the results with your measurements of a year past. He looks at the color of your skin, and feels the muscles in your arms and legs. He is pleased when he sees a good, clear color in your face, and finds firm, strong muscles.

He examines your heart. As you know, the blood is the carrier which takes food and oxygen all over the body. The heart is the pump which keeps the blood moving. You can see why the doctor likes to find your heart in good condition.

The doctor may look in your throat and nose, to see that your tonsils are all right, and that your breathing is not hindered by adenoids. He may test your eyes, to see whether you need to go to an eye specialist.

These things, and others which the doctor may do, will tell him whether you are as well as you could possibly be. Perhaps he will find some small thing wrong, which needs to be corrected. It may

not amount to much now, but it may cause a great deal of trouble later, if nothing is done about it. You can help yourself and your parents by being willing to do whatever the doctor advises.

The doctor will probably advise you to protect yourself from smallpox and diphtheria, if you have not already done so. The body has its own ways of fighting diseases caused by germs, but scientists have found that vaccination against smallpox and immunization against diphtheria are necessary to prevent these diseases. Such protection helps you to keep fit.

Whenever disease germs get into the body and live and grow there so that they cause an unhealthy condition, we say there is an infection. The body fights against this in several ways. Although the blood looks red to you, there are white cells in it. These white cells gather at any place where there are germs, and begin to destroy the germs. The white cells fight all kinds of germs, but the body also makes fighters which make war against particular diseases.

When the doctor vaccinates you, he rubs some carefully prepared weakened smallpox germs into your skin. This will not give you smallpox, but it is enough to start your body to making the

materials that fight smallpox. If you have had a successful vaccination, you will be protected from smallpox for years. In other words you will be immune to smallpox.

When the doctor immunizes you against diphtheria, something of the same sort happens. What he puts into your arm with his hollow needle is harmless, but it will start your body to making the materials that fight diphtheria germs. It will make you immune to diphtheria. If you live where the water supply is unsafe, you can protect yourself by being immunized against typhoid.

If you go to the doctor every year for a health examination, and if you correct the little things that need to be cared for, you may save yourself a great deal of trouble in later years. You will give yourself a kind of insurance that you will be ready and fit for work, or sports, or adventure like Admiral Byrd's if it comes to you.

Study Activities

How Did Byrd and His Men Dress?

See page 191 for the kind of clothes they wore.

See pages 153-161 to find out why they wore so much fur, and why they turned the fur inside.

H. Armstrong Roberts

IT IS A GOOD PLAN TO HAVE THE FAMILY DOCTOR GIVE REGULAR HEALTH EXAMINATIONS TO YOUNG CHILDREN OF PRE-SCHOOL AGE.

Remember that fur has many air spaces, just as feathers and down have.

Compare the clothes worn at the South Pole with those worn during the winter in your home town.

Try These on Yourself

If you are interested in finding out for yourself whether you are building habits of courage, try these questions on yourself. If you can truthfully say that the third answer tells what you do, then you can be fairly sure that you are building habits of courage. You will need to watch out that you are not fooling yourself. Be sure that you really do the things that you think you do.

A. When you make a mistake that cannot be corrected, do you
   1. cry about it?
   2. try to hide the mistake?
   3. face the consequences and make the best of it?

B. When you have to go to the dentist, do you
   1. make excuses to put it off?
   2. expect someone to give you something nice if you go?
   3. go by yourself and get it over with?

C. When you are not getting on well at school, which of the following things do you do?
   1. blame the teacher?
   2. make excuses for yourself?
   3. ask the teacher what the trouble is, and then follow her advice and try to do better?

D. When you do something wrong (most people do at some time or other) do you
   1. dodge punishment?
   2. expect someone to make it easy for you?
   3. take your punishment like a man?

E. When you have been hurt and have to stand some pain, do you
   1. make a fuss about it?
   2. expect someone to pet you or give you something?
   3. find something to do to take your mind off yourself?

F. When there is a disagreeable task to do at home, do you
   1. keep putting it off?
   2. stay out of sight until someone else has done it?
   3. cheerfully accept the task as part of your home responsibility?

Chapter XV

EARLY MAGIC

Thousands of years ago the boy who lived in Europe wandered from spring to spring with the rest of his family. His home, for over night or for a day or so, was always beside a spring. Why?

Back in those days there was nothing to drink but water. There was plenty of good water everywhere, so no other drink was necessary. Moreover, it was always safe to drink one's fill from any stream or spring.

It was not until much later that the water supply became unsafe. That was when people who built their homes near the river threw their refuse and waste into it. Then fevers often lurked in springs and streams. The people living near the streams dreaded the fevers, but they had no idea that they themselves were the cause of the trouble.

The wise ones thought hard, trying to solve the problem. No one even dreamed that there were living things so small that they could not be seen. The only explanation the wise ones could give of

the fevers was that evil spirits had crept into the water. They may have believed that the evil spirits in the water gave the fever to those who drank it.

The wise ones thought that somewhere there must be a spring that the evil spirits had not yet found. So a search was made for a spring in some far-off sheltered place. When found, such a spring was carefully guarded from the evil spirits. Night and day, men stood guard. The water of such a spring could be kept pure and safe for a long time, if no one was allowed to come near except to get water. It is easy to see how such a spring might be looked upon by the people of that time as a sacred spring, safe from the evil spirits which caused illness.

Other wise ones tried to find a way to get ahead of the evil spirits. They tried to find some drink that had no evil spirits in it. It is hard to tell just how the discovery came about. Perhaps it was by chance. At any rate someone discovered that the juice of crushed grapes quenched his thirst. Then he crushed grapes for his family. His family drank the grape juice just as soon as it was made. It was very refreshing and, of course, became popular among the neighbors. It came to be looked

upon as a sacred drink, and was even used in the temple.

As you know, grapes are ripe only at certain seasons of the year. It seemed best to find some way to keep the juice so that people might have it to drink all the year round. The juice was crushed from the grapes and then was stored away in pouches made of skin or in earthen jars for later use.

Of course you know what happened. The juice fermented and alcohol was formed. When the simple folk found that the juice had a different taste after it had been left standing a long time, they were puzzled. They may have feared that the evil spirits had crept into the grape juice. Perhaps the person who had first tasted the juice decided that the spirit could not be evil, since the juice did not give him the fever. At any rate people kept on drinking the grape juice even after they thought that there was a new spirit in it.

In some such way as this the wine industry grew up. Today, in France, most people drink wine instead of water. There are so many people in the country districts who have not yet learned to safeguard the water supply that in many places the water is not safe to drink. Does it not seem

Photograph by Wm. A. Golden, Courtesy Adolf Fassbender, F.R.P.S., N. Y. C.

THIS TWELVE-YEAR-OLD GIRL HAS GOOD MUSCULAR CONTROL.

strange that, in the very land where the boy many centuries ago drank freely from any stream or spring, people have to drink wine instead of water?

As time went on, the wise ones noticed that many of those who drank wine began to act queerly. Some who had been good leaders now behaved very foolishly. Some who had always worked steadily now sat about all day drinking and talking. Some who had been wide-awake workers now slept all day and did no work. Some who had been very skilful with their hands now bungled their tasks. The wise ones were puzzled. They thought that perhaps a new kind of evil spirit had entered the wine.

It was not until the scientist came thousands of years later, that the new evil spirit was discovered. The scientist found it less than 1000 years ago. This is how the discovery came about. The scientist already knew that water must be heated to change it into vapor. He found that vapor rose from the wine at a lower heat than it would rise from water. He heated the wine slowly until vapor rose from it. He caught the vapor and cooled it. When it was cooled, it changed back into liquid. He found that the evil spirit had left

the wine. It had gone into a new liquid. The new liquid was alcohol.

Since that time, the scientist has found out many new things about alcohol. He has learned that alcohol will kill those mischievous micro-organisms, the disease germs, that lurk in our streets, and even in our homes. He has found that alcohol will sterilize hospital instruments, because it will kill any disease germs that happen to be on the instrument when it goes into the alcohol bath. He has discovered that alcohol will preserve specimens for a museum, because it will kill bacteria that would make the dead body decay.

"If alcohol will kill those living things that are bad, and those that are dangerous to our health," thought the scientist, "what will it do to those living things that are worth-while and necessary?"

At last the scientist found an answer to this question. He found that alcohol would kill or injure the things that were good as well as the living things that were bad. The scientist also found that the alcohol which a man drinks affects the nerves, those pathways along which the messages are carried to the brain and to the muscles.

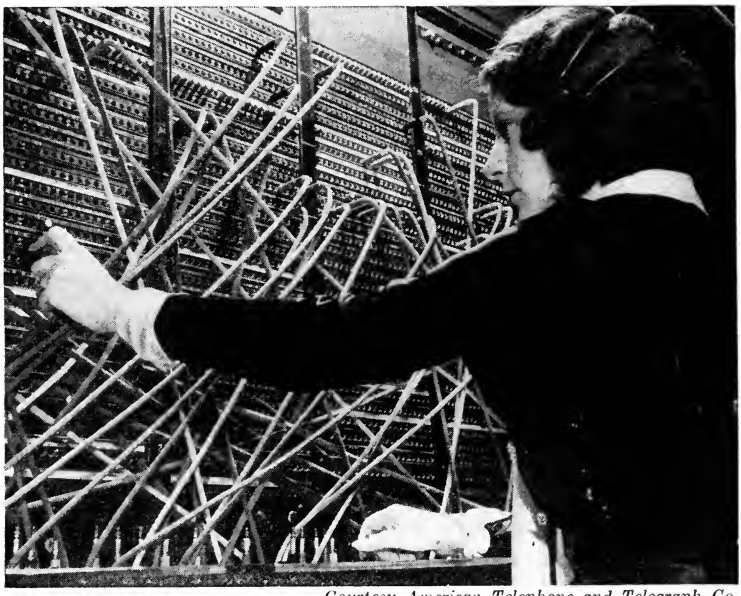
When these nerve pathways in your body are in a healthy condition the messages will run along

quickly and surely, and tell you to jump aside if you find yourself in the course of an automobile. When these nerve pathways in the body of the driver of an automobile are in a healthy condition, the driver will be able to stop his car at once, when the red traffic light flashes. When these pathways in the body of the locomotive engineer are in a good condition, he will be able to throw his engine in reverse the instant he sees a sign of danger ahead.

Alcohol prevents those very valuable pathways from working as they should. As a result the messages do not pass along the pathways quickly and surely. Sometimes the message takes a longer time to reach the brain; sometimes it fails to reach the muscle on the instant that it should. For this reason the drinking man is not always able to jump out of the way of the approaching automobile quickly enough. The intoxicated driver of an automobile does not always recognize the red light in time to stop his car. And the engineer who has been drinking is often unable to reverse his engine quickly enough to prevent a collision. Because alcohol makes the nerve pathways less sensitive, it is a narcotic. Before people understood this, they called alcohol a stimulant, but it is not. It slows

down, instead of speeding up, the person who uses it.

There are no minerals, vitamins, or proteins in alcohol, to give it food value. It may supply a



Courtesy American Telephone and Telegraph Co.

PUTTING THROUGH LONG-DISTANCE CALLS. THE NERVES ARE THE BODY'S TELEPHONE SYSTEM.

little energy, but at the same time it has harmful effects which injure the body. It does not deserve to be called a food. The person who has a habit of drinking beer often becomes very fat. The fat may be stored in places in his body where it is

harmful, as around the heart, liver, blood vessels, and muscles. A disease of the liver is also found more often among people who drink than among those who do not.

Today we need to be able to think quickly and to act quickly. Our success in our work and in our play demands that we keep our heads, and make our hands do quick work, and do it well without tiring us. We need to think clearly about the questions that come up in school and have to do with plans for work or play.

Alcohol is so important a problem that many scientists have made a study of it. The following statements come from their reports:

Alcohol acts like a toxin in the body. (A toxin is a poison made by plants or animals.)

Alcohol affects the nervous system first, but acts in an undesirable way on all the organs.

The great explorers like Livingstone, Nansen, and the Duke of Abruzzi did not use alcohol.

Winners of great contests, as in running and swimming, find it necessary to avoid the use of alcohol.

Alcohol reduces the power to do good thinking. It may leave one with a feeling of well-being but it causes loss of ability to think clearly. The feel-

ing of well-being deceives one, since it covers the real condition of the person.

Tests show this difference in the speed, the accuracy, and the endurance of the users of alcohol and those who do not use it. Two groups of young men were tested by some work on typewriters. The result showed that those who did not use alcohol could work faster. They made fewer mistakes, and could keep at a piece of work for a longer time than those who used alcoholic drinks.

Tests have shown also that the use of alcohol by workers increases the number of accidents in factories. It also causes the more serious kinds of accidents. In some countries, the employer is not held responsible for injury by accident in his factory if he can prove that the person hurt was a drinker of alcoholic liquors.

Tobacco is another narcotic which may interfere with one's fitness for work or sports. There are at least half a dozen harmful substances in tobacco smoke. Nicotine is one of those which seems to do the most harm.

There are only very small amounts of nicotine and the other drugs in tobacco smoke, but these small amounts cause certain disturbances in the body. Tobacco smoke makes one's heart work

Lewis W. Hine

HIGH ABOVE THE CITY. WORKING ON THE EMPIRE STATE BUILDING IN NEW YORK. SUCH WORK CALLS FOR GOOD NERVES AS WELL AS GOOD MUSCLES.

harder, and makes one get winded easily. Athletes cannot afford to cut down their speed and endurance by smoking, and risking such results.

A weakened heart is a handicap to anyone, whether in athletics or in the fun and work of everyday life. In sickness, a good strong heart is one of the greatest aids to recovery.

Smoking sometimes irritates the delicate lining of the nose and throat, and causes a rough,

uncomfortable feeling, with a cough or a cold. The heavy smoker often has stained teeth or fingers which mar his appearance.

Many grown people use moderate amounts of tobacco, and do not seem to be injured by it although it interferes with their fitness for sports and work calling for fine skills. However, doctors agree that its use by growing boys and girls results in more serious harm. In some places, there are laws protecting young people by forbidding the sale of cigarettes to them. One of the best protections a boy or girl can have is his own desire to do his best, in work or play.

Study Activities

Try These

Turn to page 100 if you do not remember how to take this test.

T F **1.** If you are afraid of the dark, the best thing to do is to stay away from dark places.

T F **2.** The work in Antarctica called for steady nerves, so Byrd looked for men who kept their nerves steady through the use of alcohol.

T F **3.** Men who chose their food wisely stood the strain of hard work better on the trip to the South Pole than men who did not.

T F **4.** Byrd wanted men who could take their minds off themselves when things did not go right.

T F **5.** There is nothing in the everyday life of a boy or girl that calls for courage.

T F **6.** A narcotic is used to quiet pain, or to soothe the nerves.

T F **7.** Alcohol is used to sterilize hospital instruments.

T F **8.** Tests show that the use of alcohol by factory workers causes many accidents.

T F **9.** Alcohol in the body prevents the nerve pathways in the body from carrying messages as quickly as they can at other times.

T F **10.** Alcohol helps people to think clearly.

T F **11.** Scientists have always known that there is alcohol in wine.

GLOSSARY

GLOSSARY

This Glossary gives the meanings of the hard words in this book. The markings show how to pronounce the words.

Guide to Sounds

ā as in fāte
å as in pref'åce
â as in bâre
ă as in hăt
ă as in in'fănt
ä as in härm
å as in tåsk
ȧ as in i-de'ȧ
ē as in shē
ĕ as in dĕ-pend'
ĕ as in sĕnd
ĕ as in de'cĕnt
ē as in hēr
ī as in nīght
ĭ as in hĭt
ō as in hōld
ŏ as in tŏ-bac-co
ô as in bôr'der
ŏ as in sŏd
oi as in boil
o͞o as in mo͞on
o͝o as in fo͝ot
ou as in house
s same as z
ū as in pūre
ŭ as in hŭ-māne'
û as in fûr
ŭ as in cŭp
ŭ as in cir'cŭs
ŋ as in haŋg
th as in these
zh like the z in azure

abscess (ăb'ses) A collection of pus in the tissues of any part of the body.

accuracy (ăk'ŭ-rȧ-sĭ) Freedom from mistakes.

acid (ăs'ĭd) A substance having a sour taste like that of vinegar.

adenoids (ăd'ĕ-noids) The spongy growth that sometimes develops in the passage between nose and throat and interferes with breathing through the nose.

alcohol (ăl′kō-hŏl) A colorless liquid formed by fermentation or distillation. It is the part of whisky, beer, and wine that makes people intoxicated.

alfalfa (ăl-făl′ fȧ) A valuable clover-like grass used as food for horses and cattle.

Amundsen, Roald (ah′mun-sĕn) A Norwegian explorer and the discoverer of the South Pole.

Antarctic (ănt-ärk′tĭk) The region at the South Pole and near it.

aquarium (ȧ-kwā′rĭ-ŭm) A place where water plants and water animals are cared for. It may be a pond, tank, or glass globe or a whole building.

aqueduct (ăk′wē-dŭkt) A canal or channel for conveying water from one place to another.

bacteria (băk-tē′rĭ-ȧ) Very small living organisms that belong to the plant kingdom. The singular is bacterium. Some kinds cause disease.

barbarian (bär-bā′rĭ-ăn) A savage and uncivilized person.

beri-beri (bĕr′i-bĕr-i) An acute disease of the nerves. It is caused by a lack of vitamin B in the diet.

blue heron (her′ŭn) A large bird with a long bill and long slender legs.

calcium (kal′sĭ-ŭm) A substance necessary for building strong bones and teeth.

carbon dioxide (kär′bŏn dī-ŏk′sīd) A gas given off from decaying matter and from the lungs of animals. It furnishes food for plants.

cement (cē-mĕnt′) A hard substance which covers the root of the tooth.

chemist (kĕm′ĭst) One who prepares and compounds drugs and medicines.

Chile (chĭl′ĭ) A republic of South America extending along the Pacific coast.

chlorophyl (chlō′rō-fĭl) The green coloring matter found in the cells of plants which have been exposed to the light. This green matter enables plants to make food (sugars) from carbon dioxide.

Cologne (ko-lōhn′) A very beautiful city in Germany on the River Rhine.

curd (kûrd) The thickened part of milk used to make cheese, or eaten as food, as "curds and whey."

dentin (den′tĭn) The bone-like material under the enamel of the tooth. It forms the body of the tooth.

digested (dĭ-jĕs′ted) Food is digested when it is changed into forms which the body can use.

digestive juices The juices which aid in the digestion of the food.

diphtheria (dif-thē′ri-ä) A very contagious disease

in which the person has a fever and a peculiar kind of sore throat.

disease germs Very small living organisms that cause disease.

Duke of Abruzzi (ah-broot′ sēē) An Italian naval officer and explorer.

Duluth (du-lūth′) An important city in Minnesota.

Edison, Thomas A. Inventor of the electric light.

enamel (en-ăm′ĕl) The hard, bony covering of the tooth above the gums.

energy (ĕn′ĕr-jĭ) The power to do work or to exert oneself in any activity.

experiment (ex-pĕr′i-mĕnt) A kind of test to discover something new, or to find out the truth about something.

Fahrenheit (fä′rĕn-hīt) A thermometer scale for measuring degrees of temperature. 32° on this scale is the freezing point of water. 212° at sea level is the boiling point for water. The scale is named for the man who invented it.

fever (fē′vĕr) A sign of illness in which the body temperature is higher than usual.

field of vision The scene which is visible to the eyes when they are in a fixed position.

flexible (flĕk′sĭ-b'l) Something which is not stiff and is easily bent.

food canal The long tube within the body through which the food passes.

germ A very small living organism.

grain germ The germ of the grain is the part of the seed from which the plant sprouts.

granulated Consisting of small grains. Cane juice granulates into sugar.

immune (ĭ-mūn′) Protected against a certain disease by substances in the blood that render certain bacteria harmless.

immunization The act of giving immunity or protection from a certain disease, such as smallpox or diphtheria.

incandescent (in-kăn-dĕs′ĕnt) Glowing with heat. A kind of lamp with an electric current passing through it is an incandescent lamp.

intestine The tube-like part of the digestive tract below the stomach; the bowel.

iodine (ī′ŏ-dĭn) (or dīn) A chemical substance often used on cuts to kill germs.

limestone A rock composed chiefly of carbonate of calcium.

Little America The headquarters in Antarctica of the Byrd Expeditions.

Livingstone, David A pioneer missionary and explorer who made Africa known to the world.

lymph An important fluid in the body.

microscope (mī′krŏ-skōp) An optical instrument with a strong lens. Anything placed under the lens is made to look many times larger than it is.

mineral A substance occurring in the earth that is neither animal nor vegetable. Certain forms of some minerals, such as calcium, phosphorus and iron, are used by the body to maintain life and growth.

mukluks (mŭk′lŭks) Shoes something like Indian moccasins, worn by the Eskimos.

muscular Having well developed muscles.

Nansen, Fridtjof (nahn′sen) A famous Norwegian arctic explorer.

narcotics (nar-kŏt′ĭks) Substances which slow down the action of the nervous system and may relieve pain or produce sleep.

nicotine (nĭk′ŏ-tĭn) A very poisonous substance found in tobacco.

nitrogen (nī′trō-jĕn) A gas forming four-fifths of the air. It is one of the substances of which proteins are built.

nutrition (nū-trish′ŭn) The process by which living things, whether animal or vegetable, use the proper foods for growth and development.

oxygen (ŏk′-sĭ-jĕn) A gas which is part of the air

we breathe and which is necessary to life. It has no color, odor or taste.

pasteurize (pȧs′tẽr-īze) To kill germs in liquids by heating to 145 degrees Fahrenheit for 30 minutes, a process discovered by Louis Pasteur.

perspiration (pûr-spĭ-rā′shŭn) Sweat, the watery, salty matter given off by the skin through its pores.

phosphorus (fŏs′for-ŭs) A substance found in plants and animals in combination with other substances. It is a valuable part of teeth, bones, and body cells.

pink eye An acute contagious disease of the mucous membrane of the eye.

poisons Substances capable of producing a dangerous effect on living things.

protein (prō′tē-ĭn) A food substance abundant in such foods as milk, cheese, lean meat and white of egg. Protein foods contain nitrogen.

refrigerator A box or room for keeping foods cold.

saliva The watery fluid which is secreted by the glands in the mouth. It begins the digestion of starchy foods.

saltpeter Rock containing nitrates, found in beds in the north of Chile. It is used in the manufacture of fertilizer.

Salzburg A City in Austria.

Sault Sainte Marie (Sōō-) A city in the upper peninsula of Michigan.

scientist (sī′ĕn-tĭst) A person who knows a great deal about science and makes science his special work.

scurvy (skûr′vĭ) A peculiar kind of disease caused by a lack of vitamin C in the diet.

share A portion or amount used as a measure.

six-year molars Some of the grinding teeth that appear when one is about six years old.

sterile (stĕr′ĭl) Free from germs.

sterilize To make free from germs.

stimulant Something that increases action in the body.

survey To examine carefully.

temperature The degree of heat or cold. Body temperature is the degree of heat in the body.

tonsil One of the two, soft fleshy bodies at the back of the throat. There is one on each side.

tournament Any contest of skill in which a number of people take part.

Trier (trēr) A very old city in Germany.

ultra-violet rays Certain invisible rays of light beyond the violet rays of the spectrum of sunlight.

whisky A drink, distilled from grain or potatoes, containing 40 to 50% of alcohol.

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